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THE

PAN-PACIFIC ENTOMOLOGIST

Published by the

Pacific Coast Entomological Society

in cooperation with

The California Academy of Sciences

VOLUME TWENTY-FIVE

1949

San Francisco, California

1949

CONTENTS FOR VOLUME XXV

MAILING DATES FOR VOLUME XXV

No. 1. March 17, 1949.

No. 2. May 25, 1949.

No. 3. July 29, 1949.

No. 4. November 25, 1949.

The Pan-Pacific Entomologist

Vol. XXV, No. 1 January, 1949

THE ECOLOGY OF SYMPHYLA*

BY A. E. MICHELBACHER
University of California, Berkeley

INTRODUCTION

The class Symphyla has held the interest of naturalists since about the middle of the eighteenth century. Most of the early studies were concerned with taxonomy, anatomy and phylogenetic relationships of the group. While these subjects still attract attention, important papers dealing with the economic and ecological aspects have appeared. However, the class is a small one and, generally speaking, its study has been neglected. Greatest interest in the group has been stimulated by the fact that many investigators believe Symphyla to be a type similar to that from which the insects have arisen. Comparative studies have shown that symphylans have many characters in common with the lower insects.

The ecology of the group is poorly known, and is difficult to study because of its soil-inhabiting nature, small size, and the fact the individuals are fragile and easily injured. The subject is one that challenges the imagination and because the field has been only lightly touched, it offers a fertile subject for investigation. In this discussion the present knowledge concerning the general ecological aspects of the group is considered. If emphasis of the large number of gaps in our knowledge of the group should stimulate further ecological studies, its purpose will have been served.

DESCRIPTION AND LIFE HISTORY

Symphylans are small, white, soft-bodied, centipede-like organisms, with 12 pairs of legs, although in some the first pair is reduced to wart-like structures. They are regarded as having 15 body segments, and the genital opening is just anterior to the fourth pair of legs. They have prominent antennae and at the

*Presidential address read before the Pacific Coast Entomological Society, December 18, 1948.

posterior end of the body there is a pair of functional spinnerets. Depending upon the species, they measure from about 2 to 9 mm in length.

Symphylans reproduce from eggs and the newly hatched individual has 6 pairs of legs although Tiegs (1945) reported *Hanseniella agilis* Tiegs as having 7 pairs. Molting occurs from time to time and an additional pair of legs is added with each subsequent molt until the full complement of legs is obtained. During this developmental period, body segments, scuta and antennal segments are added. At least with *Scutigerella immaculata* (Newport) molting continues at intervals during the entire life of the organism, and a single individual has been known to cast its skin as many as 52 times. To a certain point, at least, the individuals increase in size with each molt, and segments are added to the antennae. Members of the group are long lived and, in the laboratory, reared specimens have survived for more than four years. Reproduction is most active during the spring and summer. The population starts to increase in the early spring and under favorable conditions continues upward through the summer. As reproduction ceases, the population starts to decline, and usually reaches its lowest ebb in the late winter or just before reproduction gets well under way in the spring.

Distribution

Symphylans are widely distributed in nature. They are found under many climatic conditions, and are likely to be encountered everywhere except in the arctic regions. However, they appear to be most abundant in the warmer temperate and tropical regions. Some species are adapted to desert areas, others to humid regions. They occur in cultivated as well as uncultivated soils. Some prefer grassland, others forested or shrub-covered terrain. They are likely to be encountered from below sea level to at least an elevation of about 10,000 feet. At Point Reyes, *Symphylella essigi* Michelbacher has been collected in fair abundance at about high tide level. Actually there are species which occur in localities well below sea level, for *Scutigerella palmonii* Michelbacher was described from specimens collected in Palestine on the bank of the River Jordan near its emergence from the Sea of Galilee, which is more than 600 feet below sea level. *Scutigerella immaculata* (Newport) and *Symphylella subterranea* Michelbacher both occur sympatricly in the delta region of the Sacramento

River which ranges from less than 10 feet above to 15 feet below sea level. Symphylans are also found well distributed in the high mountains of California, and in Europe both Verhoeff (1933) and Friedel (1928) have reported collecting *Scutigerella immaculata* (Newport) at an elevation of 3000 meters.

Some species are found most abundantly in the surface soil, some appear to prefer the decaying forest litter and the soil just beneath it; still others are adapted to a wide range of movement in the soil, and some appear to prefer the subsoil. They are found in all soil types, which range from sands to clays and peats.

Symphylans apparently are unable to construct their own runways in the soil, therefore soil texture and structure greatly influence their distribution and abundance in localized areas. In general, they are to be found in greatest numbers where the soil structure is open. For this reason, uncultivated or undisturbed soils offer a more favorable environment for the development of most species than that encountered where cultivation is practiced. This is particularly true of those species which prefer the surface soil and it is possible that cultivation will so modify the environment of those species that inhabit the decaying forest litter and the soil just beneath it to a point where the species will no longer be able to survive.

Cultivation destroys the countless number of runways made by natural agencies such as decaying roots, and small soil-inhabiting organisms. Further, it alters the natural porousness and openness of the soil structure by producing changes in the crumb structure.

The changes produced by cultivation also probably exert an influence on those species of symphylans that range through the entire soil horizon and into the subsoil. However, most of these species are well adapted to living under conditions of soil cultivation and are often found present in cultivated fields in large numbers.

The symphylan that has received the most attention is *Scutigerella immaculata* (Newport). This species ranges from just under the surface of the soil to a depth of 4½ feet. It is well adapted to living in the subsoil, and in cultivated fields this zone furnishes a most favorable retreat. A large portion of its life is spent here, as is attested by the tremendous number of molted skins found in the runways. This species also ranges freely

through the cultivated zone, and its movements are little hampered unless this soil horizon is thoroughly packed. It will move into the cultivated soil and destroy germinating seeds. However, if at planting time a tractor wheel passes over a row and thoroughly firms the soil, the germinating seed frequently escapes injury, due to the fact that the movement of the organism is greatly interfered with.

Symphylella subterranea Michelbacher is another species that is little affected by cultivation. Only rarely has it been taken in the first six inches of soil. It prefers the deeper soil and is likely to be found in most abundance below the 12 inch level, and therefore lives in a region seldom interfered with by cultivation.

Populations

The determination of symphylan populations is very difficult. Because they are so fragile and easily injured, it is difficult to recover them when a Berlese funnel is used. Because of this, a water flotation method of separation was developed (Michelbacher 1938). With this method it was determined that about 70 per cent of the individuals in a sandy silt soil could be recovered. On two occasions the efficiency of the above two means of separation were compared. In each survey 12 soil samples were run by each of the methods. In the first experiment a total of 157 symphylans were recovered by the water flotation method as compared to 17 for the Berlese funnel, and in the second, the ratio was 214 to 54. These tests definitely showed that the water flotation method was superior to the Berlese funnel. However, where a separation is desired from a sample containing considerable decaying forest litter or similar material, it is very possible that a Berlese funnel would give a more satisfactory separation because the debris contained in such samples would certainly interfere with the efficiency of the water flotation method.

Numerous population studies using the water flotation method have been conducted in the delta region of the Sacramento River and in greenhouses. In a field devoted to the production of field and truck crops the population of *Scutigerella immaculata* (Newport) was calculated to be 22,700,000 and that of *Symphylella subterranea* Michelbacher 2,705,000 per acre. In an adjacent field where the seasonal population trends were being followed, the

peak population of *Scutigerella immaculata* (Newport) encountered was 8,000,000 while that for *Symphylella subterranea* Michelbacher was 4,915,000. These last populations were determined from samples taken on July 16.

Large populations of *Scutigerella immaculata* (Newport) are frequently found in greenhouses. In one where snapdragons were being seriously injured by this symphylan the population on an acre basis was found to be 90,300,000. All the above populations were calculated from the actual number of symphylans obtained from the samples, and no factor was applied for the probable number of individuals not recovered. Similar substantiating studies were conducted by the author where large populations of *Scutigerella immaculata* (Newport) were found to occur.

The populations reported above are larger than those encountered by most investigators who have considered symphylan populations. However, large populations were reported by Van Zwaluwenburg (1931) who carried out investigations in the Hawaiian Islands. The species involved were *Symphylella neotropica* (Hansen) and *S. simplex* (Hansen). These symphylans averaged about 90 per surface square foot in a growing cane field as against 150 in a fallow series. This on an acre basis is equivalent to 3,920,400 and 6,543,000 respectively.

Although found in lesser numbers, Symphylans have figured in many investigations that have involved population studies of the invertebrate soil fauna. Among those reporting their presence are Morris (1922, 1927), Thompson (1924), Edwards (1929), Sawa (1930), Starling (1944) and Pearse (1946). The investigations were conducted under several environments which included pasture, grass, arable and forested land. Thompson (1924) in his investigations found that Symphyla constituted 86 per cent of the total Myriapoda population. Edwards (1929) also found them to be much more abundant than all the other myriapods combined. Other workers have found them to be less abundant than some of the other myriapods. Among these Starling (1944) reported Symphyla as constituting 9.2 per cent of the population, while Pearse (1946) reported them as composing 32.9 per cent of the myriapod population.

Based on population studies and observations it appears that symphylans are not rare as stated by Ross (1948) but are probably the most abundant of all the myriapods as far as the number

of individuals are concerned. Certainly they are found in large numbers wherever favorable environments are encountered.

Although individuals are found in abundance, the number of known species of Symphyla is not over 100. This paucity of species is due, at least in part, to the fact that the group has been badly neglected. In conducting surveys, undescribed material is frequently encountered, and it is but a matter of time before the number of named species will be greatly increased.

Some species have a rather wide geographical distribution. *Scutigerella immaculata* (Newport) probably has the widest known distribution, although some records that pertain to it apply to closely related forms. In my own experience this was true of certain specimens identified as *Scutigerella immaculata* (Newport) from various points in Europe which have proved to be new species.

Some species are widely distributed in California. Among these are *Scutigerella immaculata* (Newport), *Hanseniella vandykei* Michelbacher, *Symphylella essigi* Michelbacher, and *Geophilella americana* (Hilton), but present knowledge indicates that the distribution of many species is extremely limited. A number described from California are known only from the type locality. These include *Scutigerella linsleyi* Michelbacher, *Symphylellopsis alba* Michelbacher, *S. oviceps* Michelbacher and *S. longiseta* Michelbacher.

Some genera apparently have a wide geographical distribution, without being represented by many species. For example, *Geophilella* as known at present is represented by but two species. One of these was described from Europe and the other from California. Although widely separated the two species are extremely closely related, which would indicate that the genus is probably conservative. The same appears to be true of *Symphylellopsis* which contains but four species, three from Europe and the other from California. Here again the species are all very closely related, and show no marked divergence.

Food

The food habits of symphyla as a group are poorly known. On the whole they feed on a vegetable diet although some species, at least, will feed on animal matter. The subject is certainly in need of thorough investigation and a complete knowledge of the exact type of food preferred by the several groups of Symphyla must await these studies.

Food habits are best known in the case of *Scutigerella immaculata* (Newport). Newport (1845) and Latzel (1884) believed they fed upon the smaller soil-inhabiting arthropods. Williams (1907) thought that Protozoa which swarm over the decaying materials of a forest floor probably made up the major portion of their food. Later investigations have established that they are primarily vegetable feeders. They feed upon the roots of many of the higher plants, and even the foliage of some, if it is available. Michelbacher (1938) successfully reared them on the leaves of lettuce. There can be but little doubt that under moist conditions, and where the leaves of such plants as lettuce are in contact with the soil, *Scutigerella immaculata* (Newport) will come to the surface to feed. In such an environment they can sometimes be found just beneath the soil surface, or even beneath a leaf. Although *Scutigerella immaculata* (Newport) probably prefers succulent vegetation, they do feed on lower forms of plant life. Michelbacher (1938) noted that they fed heavily on compressed yeast, and believed that they fed on the unicellular green algae as well as fungi which grew on the substratum of the rearing dishes. He also noted that *Scutigerella immaculata* (Newport) ate any individuals that died and observed them feeding on injured specimens. The apparent ability of *Scutigerella immaculata* (Newport) to feed on the soil microflora probably accounts for their living in the absence of apparent food as has been observed by a number of investigators, including Wymore (1924) Friedel (1928) and Almeida (1930).

Higher plants certainly influence the distribution of *Scutigerella immaculata* (Newport) in the soil. They are attracted to growing vegetation, and population studies and other observations have shown them to be most abundant about growing plants. They will come up to just beneath the surface of the soil to feed on germinating seeds and young seedlings or recently transplanted plants, and occasionally, as already noted, they come to the soil surface to feed on leaves in contact with the soil. About growing plants they are found most abundantly within the top six inches of soil, while away from them they are found in greatest numbers in the deeper soil or subsoil.

Scutigerella immaculata (Newport) has feeding and non-feeding phases. These are associated with the molt and the non-feeding phase occurs during the critical premolting and molting per-

iod. Most food is consumed during the early period of each feeding phase.

Other Symphyla also feed on higher plants. Rand (1926) reported *Hanseniella unquiculata* (Hansen) as being injurious to sugar cane, and Takashima (1938) has also reported *Hanseniella* sp. as attacking this crop. However, there appears to be many symphylans that do not feed on living higher plants, and various investigators have believed their food to be decaying organic matter or humus. Although this may be the case, it seems more probable that they actually feed on the microflora and the saprophytic growth that arises from the humus and other organic material.

It has been shown that living higher plants exert no noticeable effect on certain species. This was clearly indicated in population studies that involved *Symphylella subterranea* Michelbacher (Michelbacher 1939). Samples of soil were taken along rows of growing plants and a similar set in the center of the space between rows. In the samples taken in the rows, 273 individuals were recovered as compared to 274 for the interspaces. Further, there was no evidence that the plants were attracting individuals to the surface layer of soil. From the above observations it appears certain that the principal food of this species must be something other than higher plants. In another laboratory conducted experiment it was found that *Symphylella essigi* Michelbacher did not appear to feed on lettuce, but fed heavily on compressed yeast.

Moisture

Moisture is one of the most important environmental factors affecting symphylans. They have relatively soft bodies, and are unable to withstand dessication. They apparently do best in moist soils, where the humidity is close to 100 per cent. Their distribution in the soil is largely influenced by the moisture content of the soil. Members of the class are most easily found when the surface soil is moist. Searching for them usually becomes more difficult as the soil dries out, and becomes discouraging when it has dried to a point where it is hard to work. Unless the soil can be easily handled and broken up for examination, the presence of symphylans is hard to detect. Due to their small size and fragile bodies, they are easily crushed or killed and difficult to find especially when searching for them under adverse conditions.

Of the symphylans studied, the moisture relationships of *Scuti-*

gerella immaculata (Newport) are best known. To a large extent this species moves up and down with the soil moisture, although some individuals are always likely to be encountered in the subsoil. They are, however, likely to be most abundant in the soil level which has a moisture content most favorable for the growth of plants. They will move into drier soil and have been encountered in such situations feeding on fleshy roots. They probably visit these locations just long enough to feed, after which they retreat to the deeper soil where moisture conditions are more ideal. The ability of *Scutigerella immaculata* (Newport) to live over a wide range in soil depths enables it to meet easily, changes in the soil moisture content. From its base in the deep subsoil *Scutigerella immaculata* (Newport) can move with ease to any horizon necessary to meet its need. An interesting vertical distribution of *Scutigerella immaculata* (Newport) was encountered in a field in late spring where a recent rain had wet the surface soil to a depth of four or five inches. The soil below this was dry for a depth of about 12 to 18 inches, beyond which it was moist. Symphylans were found in abundance in the surface and deeper moist soil, but none were encountered in the dry layer between.

Scutigerella immaculata (Newport) as well as other symphylans is not easily wet with water. Water is repelled and if trapped in the soil, they are enclosed in a tiny air bubble which affords them considerable protection from flooding. In these small air pockets the symphylans remain dry and can withstand submergence for a day or two to several weeks or longer. The length of time that they can survive depends largely upon the depth of water and temperature. In general, the period of survival decreases as the temperature rises. At low temperatures the survival period decreases as the depth of water is increased.

One point of interest is that if an air pocket containing a symphylan comes to the surface of the water it can be broken leaving the creature in a perfectly dry condition.

When land is flooded, *Scutigerella immaculata* (Newport) will, if possible, move up through the soil ahead of the rising water table, but will stop and be trapped by the rising water just under the surface of the soil. Where the soil is uneven they may congregate in large numbers just under the soil surface on the high spots. If these high spots are disturbed just before or after being flooded, symphylans will come floating to the surface of the water by the thousands. From limited observations it appears that most

species of symphyla are unable to move up ahead of a rising water table with the same ease as does *Scutigerella immaculata* (Newport). This is certainly true of *Symphylella subterranea* Michelbacher and is probably the case within all the genera where the individuals are not capable of rapid movement.

It is doubtful whether all symphylans are capable of moving as deep into the soil as does *Scutigerella immaculata* (Newport). If they are greatly restricted in their movement, the question arises as to how they survive when the soil dries out. This can not be answered at present but to speculate, it is possible that some may encyst as do certain of the millipedes. Certain habits and actions of *Hanseniella vandykei* Michelbacher lead to the belief that this might be the case.

Reaction to Light

Symphylans are eyeless and although negatively phototropic they tolerate light of low intensity. In laboratory breeding cultures of *Scutigerella immaculata* (Newport), which were stored on a shelf where the light intensity was low, individuals would come to the surface of the soil section and lie there perfectly motionless. They also did not hesitate to come to the soil surface to feed on lettuce placed there for food. However, they do try to avoid light of high intensity. This response is probably one of the main reasons that accounts for their stopping just beneath the surface of the soil when a field is flooded. Apparently they would rather face submergence than light of high intensity.

In the absence of eyes, symphylans apparently rely upon the sensory organs of their antennae to guide them through the soil.

The function of the spinnerets is not known. Some investigators, including Williams (1907b), Riley (1929), and Filinger (1931) believed that *Scutigerella immaculata* (Newport) lined their runways with silken threads, but this hardly appears to be the case. It is possible that some of the workers mistook fungus mycelia for silken threads.

Temperature

Symphylans are markedly affected by temperature. It influences their development and every phase of activity. Because of the insulating effect of their soil habitat they can tolerate a wide range in air temperature.

Investigations which have been conducted indicate that for normal activity the optimum temperature of their environment is betaween 12 and 20° C.

Conclusion

Only a brief review has been presented concerning the ecology of symphyla. The picture is still very incomplete and there are many gaps to be filled. Although there are many obstacles to be overcome in attacking the problem, it appears that these are not insumountable. Advances in rearing technique should go far in paving the way for additional studies. Because the field has been so poorly investigated, it offers a fertile opportunity for further study. Initiative and a well planned program should reap a rich reward.

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APHIDS IN RELATION TO QUICK DECLINE AND TRISTEZIA OF CITRUS

BY E. O. ESSIG
University of California, Berkeley

The role of aphids as transmitters of plant virus diseases is becoming more important as a better understanding of these diseases is developed. Other plant troubles involving grafting and budding and the difficulties of combining two varieties or types of closely related plants as one are also entering into the complex. Just what the insects do in such cases is a problem that may require years of investigation.

The mysterious disease called "quick decline" of citrus in California and the so-called "*zonate chlorosis*" or "*tristezia*" of Brazil are thought to incriminate aphids as possible carriers and vectors.

The *tristezia* in Brazil is believed to be carried by the black citrus or camellia aphid, *Toxoptera aurantii* (Boyer de Fonscolombe), and the brown citrus aphid, *Aphis citricidus* (Kirkaldy). In South Africa, where a similar disease of citrus occurs, this latter aphid is known as *Aphis tavaresi* Del Guercio, but it is definitely a synonym of *A. citricidus*, which in its present role is fortunately a more descriptive name.

It is the purpose of this note to call attention to the aphids rather than to their possible role as transmitters of plant virus diseases.

Although these two species, representing different genera, are rather readily identified alive in the orchard as well as mounted specimens in the laboratory, yet they are really quite different anatomically and may be easily separated.

The most important and unusual character common to these two citrus-infesting species, not found in any other known aphids, is a net-like pattern (figs. 1, 3) on the venter of the abdomen on segments V, VI, and VII and especially under the bases of the cornicles. It may occupy much of the underside of one or more segments. This design consists of a matrix of somewhat parallel lines that branch, curve, and coalesce to form variously shaped linear and angular areas. Under high magnifications the posterior

margins of the fine lines appear toothed, like a saw (fig. 3). This network is easily visible on cleared specimens under high magnification. It has been noted by Theobald (1917, fig. 3; 1929, fig. 14), Blanchard (1925, fig. 5) [Chitizination on venter, not dorsum], Reiniger (1942) and Zimmerman (1948), who showed enlargements of the gross areas.

Differences

Aphis citricidus (fig. 1)	*Toxoptera aurantii* (figs. 2, 3)
1. Stigma of forewing pale	1. Stigma of forewing conspicuously black
2. Cubital or media vein 2-forked	2. Cubital or media vein usually 1-forked (rarely 2-forked)
3. Antennal segment III all black	3. Antennal segment III pale with extreme tip black
4. Antennal segment III with 10-20 scattered sensoria. Antennal segment IV with 2-4 sensoria	4. Antennal segment III with 6-8 circular sensoria in straight line. Antennal segment IV without sensoria.

The Brown Citrus Aphid

Aphis citricidus (Kirkaldy)
Myzus citricidus Kirkaldy 1907
Aphis tavaresi Del Guercio 1908
Aphis citricola van der Goot 1912
(fig. 1)

This dark tropical species was originally described in the genus *Myzus* by Kirkaldy (1907:100) from specimens taken on *Citrus* on the Island of Oahu, Territory of Hawaii. The following comments accompanied the description: "it is probably an introduction from China, and is very common on *Citrus* all over the Hawaiian Islands." As *Aphis tavaresi* it was named by Del Guercio (1908:143) on *Citrus* spp. collected in the region of Zambezi, Africa, by J. S. Tavares. Van der Goot (1912:273) also described the same species under the name *Aphis citricola*. His specimens were collected on *Citrus* in Chile by R. Paessler.

This is a relatively large dark brown or almost black species that may readily be confused with such other species as *Aphis gossipii* Glover, *A. cooki* Essig, *Toxoptera aurantii* (B. de Fonsc.) that also commonly occur on citrus.

It is reported to be the vector of the virus disease known as tristezia in Brazil.

HOST PLANTS

The brown citrus aphid has been taken chiefly on the various species of *Citrus*, but it has also been reported as feeding on the following plants: *Azalea, Cudrania triscuspidata, Diospyros kaki, Ficus carica, Poncirus trifoliata, Pyrus communis* (*?*), *Toddalia asiatica* and *Trema orientalis.*

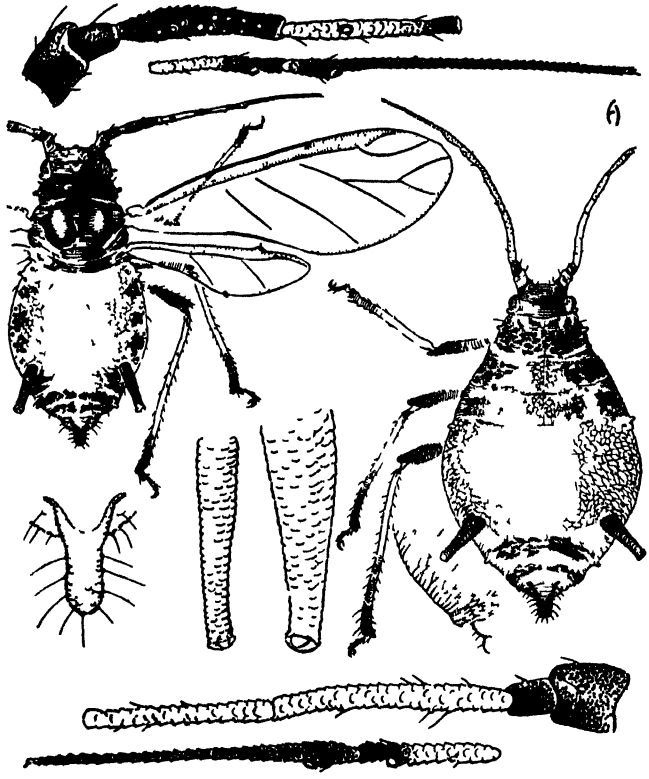

Fig. 1. *Aphis citricidus* (Kirkaldy). Anatomical characteristics of the alate and apterous forms. (Drawing by Frieda Abernathy).

DISTRIBUTION

The distribution of the brown citrus aphid is more strictly tropical than that of the black citrus aphid. It does not appear to have been as widely disseminated by commerce which may be accounted for by its less omnivorous habits and more restricted range of host plants.

The following localities have been noted:

AFRICA: Belgian Congo, British East Africa, Cameroun, French Congo, French West Africa, Gold Coast, Italian Somaliland, Kenya, Morocco, Mozambique, Nairobi, Nyasaland, Rhodesia, Tanganyika, Uganda, Union of South Africa.

ASIA: Ceylon, China (Chekiang, Fukien, Kaingsu, Kwangtung), Cyprus, French Indo China, India (Bengal, Madras, Mysore), Java, Loochoo, Japan, Malaya, Okinawa, Sumatra, Taiwan.

AUSTRALIA: West Australia.

CENTRAL AMERICA

EUROPE: Italy, Malta, Sicily, Spain.

NEW ZEALAND

PACIFIC AREA: Fiji, Territory of Hawaii, (Hawaii, Hilo, Kaui, Oahu, Maui), Mauritius, Samoa.

SOUTH AMERICA: Argentina, Brazil, Chile, Peru, Trinidad.

THE BLACK CITRUS APHID

Toxoptera aurantii (Boyer de Fonscolombe) 1841
Aphis camelliae Koch 1843
Toxoptera aurantiae Koch 1856
Aphis coffeae Nietner 1880
Ceylonia theaecola Buckton 1891
Toxoptera theobromae Schouteden 1906
Aphis citrifoliae Shiraki 1913
(Figs. 2 and 3)

This medium-sized black species is characterized by white markings on the legs and antennae, the very prominent black stigma, usually the single-branched media or cubital vein of the forewings, and the net-like markings on the venter of the abdomen beneath the cornicles.

It is primarily a tropical and subtropical species extending its range into the warmer temperate regions in greenhouses, lathhouses, residences, and even out of doors in very favorable localities.

Although this species was used in a large number of tests in California by Dickson, Flock, and Johnson (1948) no transmission of quick decline has so far been observed.

According to Posnette (1944) it also transmits the swollen shoot disease of cacao in the Gold Coast Colony.

This species is highly susceptible to parasitism by *Aphidius confusus* Ashmead and related braconids in California and the

mummied bodies of the hosts may be found in great numbers on the curled leaves of the new trminal growth of the host plants.

HOST PLANTS

The black citrus aphid has a wide range of host plants and is especially abundant on and injurious to the various species and

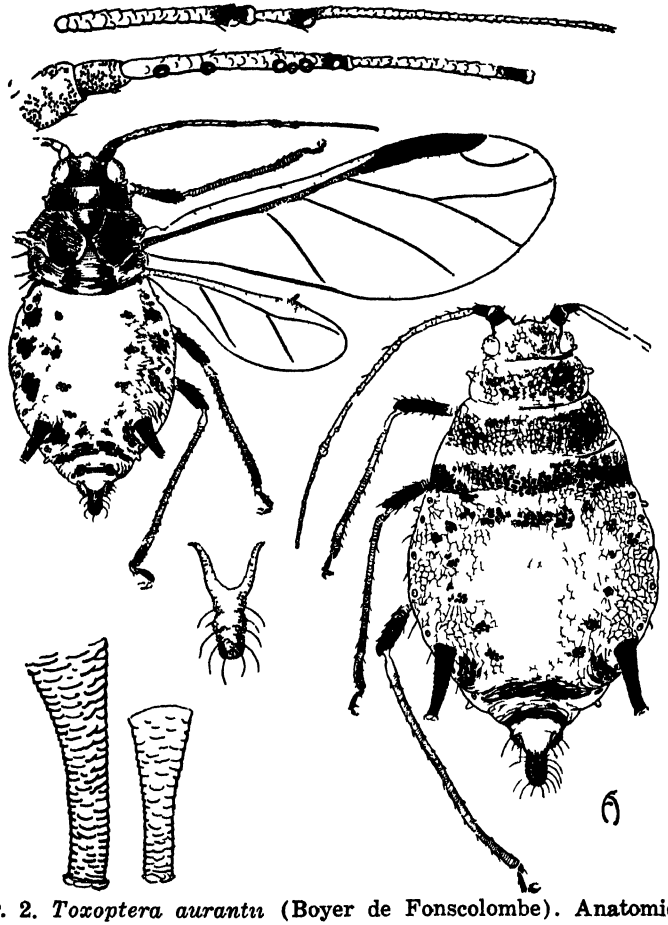

Fig. 2. *Toxoptera aurantii* (Boyer de Fonscolombe). Anatomical characteristics of the alate and apterous forms. (After Zimmerman, 1948).

varieties of *Cacao, Camellia, Citrus* and *Ficus*. A list of hosts include: *Acronychia pedunculata, Albizzia odoratissima, Algaia odorata, Alnus cordata, Anona squamosa, Antigonum, Apocynum,*

Ardisia sieboldi, Artabotrys odoratissimum, Artocarpus integrifolia (*A. integra*), *Berberis tenuifolia, Bidens pilosa, Butea fondrosa, Callophyllum inophyllum, Camellia caudata, C. drupifera, C. japonica, C. oleiferum, C. thea, Camomilla, Cassia glauca, Chincona, Citrus aurantifolia, C. aurantium, C. limonum, C. maxima, C. medica, Cladium, Coffea arabica, C. liberica, Cratoxylon polyanthus, Cydonia japonica, Distylium stellare, Ehretia buxifolia, Eugenia aquea, E. sandwicensis, Eucalyptus robusta, Evodia aromatica, Ficus aukeotsang, F. ampelos, F. aurantii, F. fovoelata, F. hispida, F. obscura, F. pumila, F. retusa, Gardenia florida, G. jasminoides, Helicia, Hibiscus arnottianus, H. rosasinensis, H. tiliaceus, Ilex anomala, I. aquifolium, I. rotunda, Illicium anisatum, Ixora macrothyrsa, Lagerstroemia indica, Lansium domesticum, Litchi chinensis, Loranthus, Macadamia, Macaranga tanarius, Magnolia grandiflora, Mangifera indica, Masea sinesnsis, M. tenera, Morus alba, Murraya exotica, Musea lanceolata, Myrsene lessertiana, M. sandwicensis, Nephelium lappaceum, Nesaea myrtifolium, Odina wodier, Oxalis, Panax, Pelea, Pellionia, Pittosporum glabrum, P. tobira, Plieogynium solandri, Pyrus communis, P. serotina, P. sinensis, Quercus, Randia spinosa, R. sinensis, Rhamnus alaternus, Sageretia theezans, Salix babylonica, S. warburgii, Sapota achras, Saraca declinata, Scaevola chamissoniana, Schima noronhae, Scolopia crenata, Severinia buxifolia, Straussia, Styrax japonicum, S. suberifolium, Symplocos sessilifolia, Thea caudata, T. sinensis, Theobroma cacao, Trema amboinensis, Trachelospermum jasminoides, Uvaria narum, Vaccinium varingiaefolia, Vanda, Viburnum odoratissimum, V. tinus, Xylosma racemosum* var. *Kwangtungensis, Zelkova schneideriana* (?).

Distribution

The distribution of the black citrus aphid comprises the tropical, sub-tropical and warmer temperate regions of the world wherever its important host plants occur. It is also a greenhouse inhabitant in the temperate regions. The following distributional list is probably only an indication of its true geographical range:

AFRICA: Belgian Congo, French Congo, German East Africa, Gold Coast, Italian Somaliland, Cameroun, Kenya, Morocco, Nyasaland, São Tomé, Tanganyika, Uganda, Union of South Africa.

ASIA: Caucasus, Ceylon, China (Chekiang, Fukien, Kwangtung), French Indo China, Georgia, India (Assam, Madras), Java,

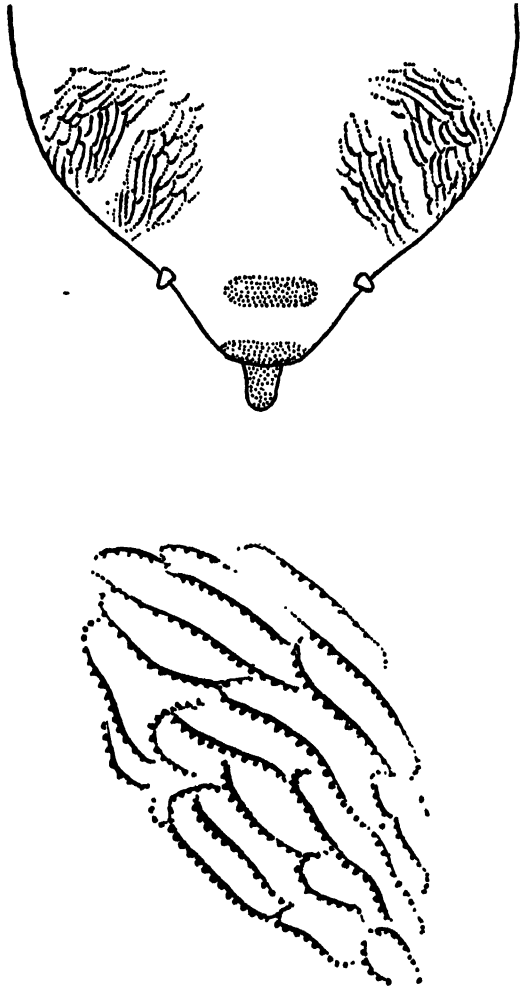

Fig. 8. *Toxoptera aurantii. Top*—net-like structures on venter of abdomen; bottom—enlargement of same to show saw-toothed structures. (Drawing by Frieda Abernathy).

Malaya, Palestine, Philippine Islands, Sumatra, Taiwan, Transcaucasia, Turkey.

AUSTRALIA: New South Wales, Queensland, Victoria, West Australia.

EUROPE: Italy, Malta, Spain.

NEW ZEALAND

NORTH AMERICA: Barbados, California, Cuba, Dominica, Florida, Guatemala, Mississippi, Montserrat, Puerto Rico, Santo Domingo, St. Thomas, Windward and Leeward Islands.

PACIFIC AREA: Fiji, Guam, Hawaiian Islands (Kauai, Oahu, Molokai, Maui, Hawaii), Samoa.

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OBSERVATIONS ON THE LIFE HISTORY OF CHLOROSEA BANKSARIA SPERRY
(Lepidoptera: Geometridae)

BY FREDERICK H. RINDGE
University of California, Berkeley

CHLOROSEA BANKSARIA Sperry

Chlorosea nevadaria, Packard, 1876, Mono. Geom., p. 378 (in part); Prout, 1932, Macrolep. World, 8:42 (not Packard, 1874).
Chlorosea banksaria Sperry, 1944, Can. Ent., 76:36.

This beautiful moth is widespread throughout the Pacific States from British Columbia to southern California and is of rather common occurrence in much of its range. Nevertheless, its life history does not appear to have been published.

A single larva of this species was obtained April 12, 1948, from beating *Ceanothus thyrsiflorus* Esch. in the vicinity of Kings Mountain, San Mateo County, California, at approximately 2000 feet altitude. This caterpillar was reared in the laboratory on the above food plant, pupation occurred April 29, and the adult emerged May 16, 1948.

Antepenultimate instar. Head width 0.8 mm., height 0.7 mm., length 0.3 mm. No further observations made.

Penultimate instar. Head rather small, the thorax and abdomen with prominent lateral projections on the segments. Head slightly bilobed, coarsely rugose, purplish-brown, with light brown on ocellar region and front of lobes. Labrum and antennae light green. Width 1.0 mm., height 1.1 mm., length 0.6 mm.

Thorax with very prominent dorsal and lateral protuberances. Prothorax anteriorly with very high median conical pair of projections, extending dorso-anteriorly over the head, and with smaller pair laterad of these; two smaller pairs of protuberances posteriorly along dorsum, the posterior of these being quite small and inconspicuous. Mesothorax with three pairs of median humps dorsally, the anterior two rounded swellings, the posterior a prominent pair of protuberances. Metathorax with single pair of small median lobes. Dorso-lateral margins of meso- and metathorax produced into prominent lateral extensions. Dorsally dark green, with purplish cast; all projections, swellings and lateral extensions purple; spiracular swellings orange-yellow. Laterally and ventrally light green. Legs purplish. Surface of thorax and abdomen heavily

granular, the granules with whitish cast, especially on sides of body. Setae on thorax and abdomen small, colorless.

Abdomen dorsally with anterior mid-line paired swellings on each segment, these being quite small and inconspicuous on anterior segments but increasing in size posteriorly, on last segment very high and conspicuous. Lateral margins of each segment produced into long prominent extensions extending laterally and upwards but not beyond anterior margins of segments, being most produced at anterior margins of segments and most prominent on segments two, three, four and five; on posterior three segments reduced to large rounded swellings. Dorsally dark green, slightly lighter than on thorax; tips and margins of lateral extensions purple, as are the mid-line paired swellings, these latter becoming more prominently marked with purple posteriorly, so that the last four segments are purple dorsally. Laterally, green as above except posteriorly on last three segments, these being purplish and including both prolegs. Ventrally, deep purple on segments three and four, bordered laterally by broad band of white granules. Spiracles light orange-yellow. Intersegmental membranes yellow-green. Anal plate greenish with slight pinkish-purple cast posteriorly.

Ultimate instar. Appears as before. Head width 1.5 mm., height 1.7 mm., length 0.8 mm.; subrectangular, only slightly bilobed, with anterior surface flattened. Setae small, inconspicuous; second posterior setae near vertex; second adfrontal setae on same level as first posterior setae; first adfrontal setae equidistant from second adfrontal and first posterior setae, closer to these than to frontal setae; anterior setae form slightly more than a right angle; ocellar setae form right angle; six ocelli well developed.

Body lighter green, matching the *Ceanothus* leaves; head and legs reddish brown; thoracic markings reddish; abdominal markings red-brown with purple cast. All setae very small, inconspicuous. Prothoracic setae Ia, Ib, IIa from large dorsal reddish protuberances; IIb from posterior base of protuberance bearing IIa; IV and V below spiracle. Mesothoracic setae Ia from dorsal reddish protuberance, Ib laterad of this; remainder of setae from lateral projections. Metathoracic setae similarly arranged.

Abdominal setae I from anterior protuberances except on first segment, II from inconspicuous base; on segments six and seven I and II more laterad than on preceding segments; setae I on eighth segment mounted on very prominent spine directed posteriorly; III dorso-anterior to spiracles on segments two to seven, while on segments one and eight they are dorsad; setae IV and V at extreme ends of wide lateral projections; VI posterior; VII and VIII in usual positions. Spiracles on second, third, fourth, fifth, seventh and eighth segments on dorsal surface; those on remaining segments on lateral surface.

The larva has the trembling or quivering motions as has been noted for others in this subfamily in the genera *Nemoria* (Comstock and Dammers, 1937; Comstock and Henne, 1940; Comstock, 1945), *Synchlora* (Comstock and Dammers, 1937) and *Cheteoscelis* (Hulst, 1888).

Pupa. Light green, more or less concolorous with food plant; head regions and posterior part of abdomen ventrally shaded with yellow-green; wing cases and appendages rugose. Cremaster of eight curved spines, subequal in length, arising from lateral margins of last segment; the latter ventrally with surface thrown up into numerous ridges. Spiracles elongate, slightly shaded with yellow-brown. Length 14 mm., width 4 mm. A day or two before emergence the abdominal spots of the adult show through very plainly, and the antennae and other appendages become darker along their margins. Pupation occurred on the food plant, in a delicate webbing between adjacent branches and leaves.

The larvae of *Chlorochlamys chloroleucaria* (Guenée) and *Nemoria rubrifrontaria* (Packard) have been described and illustrated in detail by Dethier (1942). The larva of *Chlorosea banksaria* Sperry may be distinguished from them by the following characters: Front of head more square and broader; first and second adfrontal setae equidistant from first posterior setae; third anterior setae on same level with first adfrontal setae, as are the second adfrontal setae and the first posterior setae; anterior setae almost form a right angle. The larvae of *Chlorochlamys* are without the prominent lateral thoracic and abdominal projections and so are immediately distinguishable. *Chlorosea* and *Nemoria* may be further differentiated in the body regions by the very small and inconspicuous setae of the former; and that the lateral abdominal processes do not extend caudad of their respective segments, and are truncate anteriorly, usually extending anteriorly at right angles from the mid-line when viewed from above.

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NOTES ON PARASITES OF CERTAIN MICROLEPIDOPTERA
(Gracilariidae)

BY J. W. TILDEN

The following leaf-mining Lepidoptera together with the enumerated parasites were reared in connection with the obtaining of material for a morphological problem.

The author is indebted to Dr. C. F. W. Muesebeck of the National Museum for determination of the parasites, and to Dr. Annette F. Braun of Cincinnati, Ohio, for the determination of the food plant variant of *Lithocolletis agrifoliella* Braun.

Lithocolletis nemoris Wlsm. This species is the common leaf miner of *Vaccinium ovatum* Pursh. The mines on the upper surface, and at first are flat and nearly spherical, becoming tentiform at last. Finally the entire upper surface of the leaf is mined and at pupation the upper epidermis of the leaf is thrown into three or more folds. Pupation is in a flattened coccon attached to the floor of the mine. The epidermis of the leaf may be removed, in most instances, without disturbing the cocoon. In many cases the lateral edges of the leaves are distorted and approach one another, so the leaves containing cocoons are trough shaped. This appears to be due to the drying of the upper epidermis after it becomes separated from the underlying tissues.

This species is heavily parasitized. Three genera of hymenopterous parasites were reared:

1. *Apanteles* sp., apparently undescribed. One parasite occurs per host larva, and upon reaching its growth, exits from the host and spins a pale yellowish cocoon in the mine but at some distance from the dead host. Upon emergence it exits from the leaf by a small circular hole in the upper epidermis of the leaf.

2. *Zagrammosoma* n. sp. (Eulophidae). This parasite emerged shortly after the material was brought into the laboratory and no notes were obtained.

3. *Chrysocharis* n. sp. (Eulophidae). The larvae of this species feed externally on the host and occur in fours. The growth is very rapid and in one case the larvae, which were very small when first noted, cast the meconium and pupated within four days. The pupae range from metallic blue to steel green in color, darkening to nearly black before emergence. The pupae are able to withstand considerable dessication, and will emerge normally even when the entire upper epidermis of the leaf is removed for observation.

Lithocolletis agrifoliella Braun. This was at first thought to be a new species, since it was reared from *Castanopsis chrysophylla* A. D.C. var. *minor* Benth. Dr. Annette F. Braun, however, regards it as a food plant variant of *agrifoliella* Braun, from the typical form of which it differs mainly by reason of a darker and richer coloration. This variant commonly mines the leaves of *Castanopsis* in the Sierra Morena (King Mountain) region of San Mateo County, California, forming upper surface mines of a similar form to those normally found on *Quercus agrifolia* Nee. This appears to be the first record of *Lithocolletis agrifoliella* Braun from *Castanopsis*.

This moth is parasitized by an undescribed species of *Chrysocharis* which closely resembles that found parasitizing *nemoris*. This parasite likewise occurs typically in fours, and may be the same species, since both hosts are found in the same area. The pupal stage is quite long, in sharp contrast to the larval stage, which is short. Pupation occurs in the mine of the host, but the larvae crawl to various parts of the mine before pupation. Four larvae which pupated on March 26, 1947, emerged as adults on May 16, a period of fifty-one days. The adults emerge from the mine by cutting minute holes in the upper epidermis of the leaf.

Gracilaria reticulata Braun. This is locally the commonest *Gracilaria* on *Quercus agrifolia* Nee, although it appears from rearings, that it is not the only species found on this oak. The mines are mostly on the under surface and near the edges, and are accompanied by considerable distortion of the leaf. Pupation may be in the mines, but more often the larvae let themselves down by silken threads and pupate in the duff below the tree.

From this moth was reared an unidentified *Gelis* sp. No notes were obtained.

STUDIES IN THE CANTHARIDAE III
(Coleoptera)

BY KENNETH M. FENDER
McMinnville, Oregon

When revisional work on the Cantharidae was begun some years ago, the author little realized the task he had assigned himself. It was thought at the time that the genus *Cantharis* was the only one of the larger genera requiring truly analytical study. Mrs. Fender (Dorothy McKey-Fender) was kindly permitted to accept this task. With the aid of Fall's work with *Podabrus*[1] and *Malthodes*[2] and Van Dyke's revision of *Silis*[3], the author's chore would be largely compilation. The inaccuracy of this line of reasoning has been indicated by the new species described by Brown[4] and Green[5, 6] as well as those of the author. Until conditions permit completion of the revisions, it is hoped that these studies will somewhat compensate for the lack.

The genus *Podabrus* can be broken down into eight groups on the basis of the ungual characters of the males. These characters hold true for only the first group in the females. In the other groups the claws of the females are the same—all claws toothed. Females of the first group have the claws similar to the males.

The many recently described species suggest a more convenient method of arranging the species for keying. Grouping the species and referring to such groups seems preferable to citing some certain couplet in Fall's key. The following key to males of the genus is offered to assist in the assignation of species to their groups. It is designed to avoid the rather terrifying first couplet of Fall which has seven parts, all but the first two parts requiring the study of all of the claws.

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[2]Fall, H. C., 1919, Ann. Ent. Soc. Am., 12: 31-42.
[3]Van Dyke, E. C., 1918, Journal N. Y. Ent. Soc., 26: 161-179.
[4]Brown, W. J., 1940. Can. Ent., 72: 161-163.
[5]Green, J. W., 1947, Trans. Am. Ent. Soc., 73: 63-76.
[6]Green, J. W., 1948, Trans. Am. Ent. Soc., 74: 75-82.

KEY TO GROUPS OF PODABRUS (MALES)

1. Claws in both sexes armed with a long acute tooth causing them to appear broadly cleft.....Group I
– Claws either finely cleft or with a broad basal tooth or some combination of these 2
2. All claws armed with a broad basal tooth, the free angle of which may be rectangular or more or less acute .....Group II
– Claws of front tarsi finely cleft 3
3. Both claws of middle tarsi finely cleft 4
– At least one claw of middle tarsi toothed 6
4. All claws finely cleft .....Group III
– At least one claw of hind tarsi toothed 5
5. Both claws of hind tarsi toothed .....Group IV
– Outer tooth of hind tarsi toothed, all other finely cleft .....Group VIII
6. Both claws of middle tarsi toothed .....Group V
– Outer claws of middle tarsi toothed, inner claws finely cleft 7
7. Both claws of hind tarsi toothed .....Group VI
– Outer claws of hind tarsi toothed, inner claws finely cleft .....Group VII

The species of *Podabrus* described to date may be assigned to their groups as follows:

GROUP I

All claws of both sexes armed with a long acute tooth causing them to appear broadly cleft.

latimanus Lec.
ambiguus Fall
rugulosus Lec.
appendiculatus Fall
knobeli Fall
frosti Fend.
frater Lec.
cascadensis Fend.
comes Lec.
conspiratus Fall
illex Fall
pruinosus Lec.
limatus Fall
falli Hopp.
tomentosus Say
dreisbachi Green
tricostatus Say
punctulatus Lec.
flavicollis Lec.
quadratus Lec.
modestus Say
intrusus Say
longicornis Fall
diadema Fab.
brunneus Fend.
protensus Lec.
fayi Lec.
brunnicollis Fab.
binotatus Lec.
confraternus Fall
sierrae Fall
knowltoni Fend.
viduus Fall
fulvus Fall

pygmaeus Green
brevicollis Fall
fissus Lec.
brimleyi Green
nothoides Lec.
basilaris Lec.
tenuis Fall
muleibris Fall
occipitalis Fall
mellitus Fall
modulatus Fall

GROUP II

All claws of both sexes armed with a broad basal tooth, the free angle of which may be rectangular or more or less acute.

extricatus Fall
lanei Fend.
tejonicus Lec. (?)
scaber Lec.
cinctipennis Lec.
limbellus Lec.
fumiganus Green
punctatus Lec.
excursus Fall
dietrichi Green
macer Lec.
piniphilus Esch.
puncticollis Kby.
extremus Lec.
brevipennis Lec.
xanthoderus Lec.
bolteri Lec.

tejonicus Lec. was described from a female and has been tentatively placed in this group by Fall.

GROUP III

All claws finely cleft in the male, in the female all broadly toothed at base.

fissilis Fall
vernalis Green

GROUP IV

Claws of male finely cleft on front and middle feet, toothed at base on the hind feet; in the female all broadly toothed at base.

lateralis Lec.
deceptus Brown
obscurevittatus Fall
secretus Brown
puberulus Lec.
simplex Lec.
pattoni Lec.
gracilis Fall
instabilis Fall
moestus Fall
tetragonoderus Fall
altus Fall

GROUP V

Claws of male finely cleft on the front feet, toothed on the middle and hind feet; all claws of the female toothed.

laevicollis Kby.
fenestratus Fall
probus Fall
citrinus Fall
perplexus Brown

GROUP VI

Claws of front feet of male finely cleft, of the middle feet outer claw toothed inner cleft, on the hind feet both claws toothed; all claws toothed in the female.

heteronychus Fall *furtivus* Fall

GROUP VII

Claws of the front feet finely cleft, of the middle and hind feet outer claw toothed inner cleft; all claws toothed in the female. *Podabrus danielsi* Fend. is our only known representative of this group.

GROUP VIII

Outer claw of hind feet of male toothed, all other cleft; all claws toothed in the female.

californicus Fend. *carmelensis* Fend.
lucidatus Fend. *rossi* Fend.
lutosus Lec. *corneus* Lec.
smithi Fend.
cavicollis Lec.

APHODIUS RECTUS MOTS. IN OREGON

(Coleoptera, Scarabaeidae)

The scarab, *Aphodius rectus* Mots., has been taken in fair numbers from cow dung in the Willamette Valley of Oregon. This species has been captured at Dayton and McMinnville with upwards of a hundred specimens having been collected. It has previously been recorded from East Siberia, Japan, China and Amur.

Two varieties are found here. The dark phase is almost entirely black occasionally with the elytral apices paler. The pale form has the elytra dark testaceous with the suture and a large triangular lateral area black, this latter dark area arising near the humerus, expanded to or almost to the suture at the apical fourth then rather abruptly truncated apically.

Drs. Ross and VanDyke and Mr. Hugh Leech of the California Academy of Sciences kindly compared this material with specimens in the Academy collection concluding that this is the species represented.—KENNETH FENDER, *McMinnville, Oregon.*

NOTES ON THE GROUP OF ANDRENA CARLINI COCKERELL, WITH DESCRIPTION OF A NEW SPECIES FROM CALIFORNIA

(Hymenoptera: Apoidea)

BY URLESS N. LANHAM
Department of Zoology, University of Michigan

The well-known *Andrena carlini* Cockerell is representative of a group of *Andrena* occurring throughout the United States which may be defined as follows:

Medium-sized to large species (11-13 mm. in length) with unbanded, nearly glabrous terga. Process of labrum large, entire or only slightly emarginate, not reflexed at tip, facial fovea broad; thorax finely sculptured, propodeal corbicula rather well developed, with interior hairy throughout, but no compact fringe of hairs anteriorly; trochanteral floccus perfect, tibial scopa with hairs of outer face simple; wings with first recurrent nervure ending near middle of second submarginal cell. Males with cheeks wide, mandibles decussate; genitalia with tips of parameres expanded, sagitta not flanged dorsally.

The very similar group of *A. vicina* Smith differs in having the trochanteral floccus imperfect (basal hears short, straight, not forming a part of the brush) and in having the tips of the parameres of the male genitalia narrow and strap-like.

The quite distinctive species described herein is characterized structurally among the species of the *carlini*-group (in the female) by the rather dull and closely, finely punctate clypeus and the triangular, narrowly truncate process of the labrum. In spite of the rather poorly developed trochanteral floccus, the other characters of female, such as the weakly produced metanotum (tending to be strongly protuberant in the *vicina*-group), and also the male genitalia, indicate the species to be a member of the *carlini*-group.

Andrena hurdi Lanham, new species

Female. Integument pure black; pubescence of dorsum of thorax, of pronotal lobes, of upper one-third of pleura, of nearly all of propodeum, and a few hairs on hind femora grayish white, with faint fulvous tinge, rest of pubescence black. Clypeus reticulate, rather dull, closely and finely punctate, punctures subcontiguous

to one pucture-width apart, no median ridge present, but a poorly developed median impunctate band apparent; process of labrum triangular, tip narrowly rounded or narrowly subtruncate, and slightly thickened; fovea extending well below dorsal margin of clypeus, tomentum black. Thorax with rather long pubescence; integument of mesoscutum nearly hidden by pubescence, dull, gran. ular, with very weak punctures; enclosure of propodeum almost hidden by pubescence at sides of the enclosure, surface finely reticulate, with a few weak wrinkles above, propodeal corbicula without conspicuously branched hairs along anterior margin; wings moderately darkened, tips darker than rest of membrane, nervures and pterostigma nearly black, second submarginal cell noticeably quadrate, the first intercubitus being nearly straight; tibial scopa somewhat looser than in *A. carlini*, spurs of hind tibia black, trochanteral floccus rather poorly developed for a member of the species-group. Terga reticulate, only slightly shining, finely, closely, and distinctly punctate, punctures on elevated portion of second tergum one to three puncture-widths apart, caudal fimbria black; pygidium broadly rounded at tip, central triangle coarsely reticulate. Length, 12 mm.; forewing, 10 mm.

Male. Head with cheeks one-half again as wide as eyes, broadly rounded; antennae with segment three distinctly longer than four, not quite as long as four plus five; hair of cheeks, of sides of face, and of face between antennae black, that of rest of head grayish white. Thorax with long pubescence, none black. Abdomen with numerous white hairs on first two terga, remaining terga with all of hairs black. Genitalia with tips of parameres moderately expanded, external margin not sinuate as in *carlini*, tip of eighth sternite distinctly emarginate. Length, 11 mm.; forewing 9 mm.

Holotype, female (Calif. Acad. Sci., Ent. No. 6118): Westley, Stanislaus County, California; 1 April, 1948; on *Brassica;* (P. D. Hurd). *Allotype,* male (Calif. Acad. Sci., Ent. No. 6119): same data as holotype. *Paratypes:* 5 females, 13 males, same data as holotype.

None of the females carried pollen loads.

A tentative key to those females of the *carlini*-group, which, like the present species, have the pleural hairs all or mostly black, follows:

1. Clypeus rather protruberant, with large, irregularly and rather sparsely distributed punctures; process of labrum very wide, broadly rounded ..... *carlini* Cockerell
– Clypeus not protruberant, with small, rather closely and more or less evenly spaced punctures; process of labrum broadly or narrowly truncate, or slightly emarginate, or triangular with narrowly rounded tip 2

2. Mesoscutum with transverse band of black pubescence between tegulae 3
– Mesoscutum without transverse band of black pubescence 4

3. Hairs of trochanteral floccus white to base, black band of mesoscutum rather inconspicuous ..... *cyanura* Cockerell
– Hairs of trochanteral floccus with basal one-half black, black band of mesoscutum conspicuous ..... *transnigra* Viereck

4. Clypeus more sparsely punctate, some punctures more than two puncture-widths apart ..... *regularis* Malloch
– Clypeus more closely punctate, punctures subcontiguous to one puncture-width apart 5

5. Process of labrum triangular, tip narrowly rounded; integument of terga pure black; propodeum without black hairs, except possibly on extreme lower margins..*hurdi* Lanham
– Process of labrum emarginate-truncate; integument of terga with slight bluish tinge; propodeum with considerable black hair, at least on dorsal fringe of corbicula and on sides of propodeum ..... *heterura* Cockerell

Mr. P. H. Timberlake has kindly compared paratypes of *A. hurdi* with the type of *A. heterura*, and found, in addition to the characters tabulated in the key, that *heterura* (female) has the pygidium acute and without sculpture (broad, reticulate in *hurdi*), and that the enclosure of the propodeum was smaller in *hurdi*, with the sides more arcuate; other differences were also apparent.

TWO NEW ICHNEUMONID HOST RECORDS

This note contributes new host records for two California Ichneumonidae.

Several larvae of *Prodenia praefica* Grote, collected from alfalfa near Tracy, California, in September, 1947, by C. Thompson, were caged and allowed to pupate. Two specimens of *Therion californicum* (Cresson) were reared from the pupae. Near Felton, California, on June 3, 1947, *Ephialtes ontario* (Cresson) was observed to oviposit in the pupae of the California oakworm *Phryganidia californica* Packard. From these collected parasitized pupae, the progeny of *E. ontario* emerged. The writer is indebted to H. K. Townes for determining the above Ichneumonidae.—K. S. HAGEN.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

E. S. Ross	A. E. Michelbacher	D. D. Jensen
Vice-President	*President*	*Secretary*

Proceedings

One Hundred and Ninety-seventh Meeting

The one hundred and ninety-seventh meeting of the Pacific Coast Entomological Society was held at 2:00 p.m., on January 17, 1948, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Michelbacher in the chair. The following members were present: J. W. Tilden, E. A. Smith, W. D. Murray, J. R. Walker, A. E. Pritchard, R. C. Miller, R. L. Usinger, H. B. Leech, E. C. Van Dyke, C. D. Duncan, W. W. Hart, T. L. Fisher, E. O. Essig, W. W. Middlekauff, E. G. Meyers, R. J. Bartges, E. F. Quinnell, E. L. Kessel, R. E. Blackwelder, A. W. Larson, R. W. L. Potts, L. R. Gillogly, J. W. MacSwain, N. W. Hazel, H. T. Reynolds, O. G. Bacon, H. F. Madsen, A. J. Walz, R. L. Doutt, F. E. Skinner, D. B. Culver, E. S. Ross, P. H. Arnaud, K. S. Hagen, E. Hagen, M. Marquis, H. P. Chandler, R. Van den Bosch, R. F. Smith, H. Blakemore, A. E. Michelbacher and D. D. Jensen. Visitors were present as follows: D. B. Reddy, A. W. Macphee, A. G. Applegarth, L. M. Henry, G. L. Smith, E. G. Wegenek and C. P. Hoyt.

The minutes of the previous meeting were read and approved.

The membership committee proposed the following for membership in the Society: G. L. Smith, Laura M. Henry, E. G. Wegenek, and C. P. Hoyt. They were unanimously elected.

The membership committee proposed that in recognition of their long and distinguished service to the Society, G. F. Ferris, E. O. Essig and E. R. Leach be elected to Honored Membership, the Society's highest award. They were unanimously elected.

President Michelbacher announced the following changes in the membership of the standing committees: *Program*: A. E. Michelbacher and R. W. L. Potts released with E. L. Kessel and R. F. Smith appointed in their stead. *Membership*: A. E. Michelbacher and R. W. L. Potts released with J. W. MacSwain and Paul Harvey appointed in their places. *Historical*: R. W. L. Potts and H. B. Leech appointed as additional members of the committee. *Publications*: E. R. Leach appointed to fill the vacancy resulting from the death of Dr. F. E. Blaisdell. E. O. Essig and G. F. Ferris reappointed to the committee with terms to expire in 1950.

Professor E. O. Essig reported that he had received an indirect request for clothing to be sent to a German entomologist and his family who are in need of assistance. After some discussion Dr.

R. C. Miller moved that a committee be appointed to receive clothing for such purposes. The motion was carried unanimously and President Michelbacher appointed C. D. Duncan, O. G. Bacon and W. Hart to serve as such a committee.

In response to a call for notes and exhibits, Dr. E. L. Kessel displayed a cerambycid larva of the genus *Ergates* which was collected alive in a piece of two by four timber being used in the construction of a house. A large burrow had been made in the wood by the larva.

J. W. Tilden exhibited an adult longicorn beetle, *Tragidion armatum* Lec. which had been collected as a larva from yucca by George Mansfield, in March, 1941, at Borego Valley in San Diego County. The larva had been carried to San Jose where it was reared to maturity in a petri dish. It emerged as an adult in July, 1941.

J. W. Tilden also exhibited first instar nymphs of a cicada, *Platypedia* sp., which had hatched from eggs at Stanford University in September, 1947.

President Michelbacher then introduced the main speaker of the meeting, Mr. Hugh B. Leech who spoke on "The Canadian Forest Insect Survey." His remarks are abstracted as follows:

The Canadian Forest Insect Survey, long envisioned by officers of the Forest Insect Unit of the Division of Entomology, became an actuality in 1935, and owed its start to an introduced pest. In 1930 the European spruce sawfly (*Gilpinia hercyniae* (Hartig), the *Diprion polytomum* Hartig of earlier reports), was found in the Gaspé Peninsula of New Brunswick, the first record for North America.

By 1935 it had almost completely defoliated 6,000 square miles of spruce in the Gaspé, and had spread into Ontario and to New York State. Its appearance in Ontario brought it to the attention of moneyed lumbering interests, while its rate of dispersal suggested that it might even reach the Pacific Coast via the northen coniferous forests.

Under such conditions, money yearly asked for by the entomologists suddenly became available. A cooperative survey project was started in 1935. The Forest Insect Unit provided advice and supervision, laboratory facilities, and specialists in insect identification; the Dominion and Provincial Forest Services and allied services, and the forest industries, provided the personnel necessary for wide coverage of the country.

In 1936 the Survey was extended to British Columbia, by which time laboratory (and organizational) centers were at Frederickton, N. B., Ottawa, Ont., Winnipeg, Man., Indian Head, Sask., and Vernon, B. C. Later, the chief Forest Insect Laboratory for Canada was built, in cooperation with the Province of Ontario, at Sault Ste. Marie, Ont., and it is now the administrative center for the Survey.

At first, all cooperators were asked to make one or more collections a month, June through September, from spruce trees.

Later they were asked to make two or more for each of the four months, and to sample all the important coniferous and deciduous trees in their areas. Special reports on any noticeable insect activities were requested.

As the data obtained in the Survey began to show its value in dollars and cents, especially with reference to an extensive and intensive outbreak of the spruce budworm, a larger budget was granted to the Forest Insect Unit. This allowed use of the survey technical personnel for nearly full-time administrative and research work. A new classification, that of Forest Insect Ranger, was established. It called for non-technical men, preferably married, with high school but not university education, and experience in the woods. These men are now the backbone of the Surveys; they work chiefly in pairs, and are assigned to definite territories. They make regular and special collections, patrol by land, water, and air, investigate reported outbreaks, establish and service permanent sample plots, cruise timber, map infestations, etc. During the winter they work up field data, submit reports, outline work for the next season, cruise timber, and attend a course of lectures on general and forest entomology. Those of each center are answerable to a Chief Ranger, not to the technical personnel; the coordinator for the entire Survey has headquarters at Sault Ste. Marie, Ontario.

Transportation has been a major problem. Where the terrain permits or enforces it, outrigger canoes and larger boats are used; elsewhere, chiefly 4-wheel drive army vehicles (HUP's), which will be replaced as more desirable models become available. Through the generosity of the cooperating services, rangers go as passengers on various car, boat and plane trips, often to areas not usually accessible.

With trained rangers making a good proportion of the monthly collections, the field data are more accurate and have broader coverage each year. With increased personnel, the significance of the work in forest conservation and industry, and in pure research, will be increasingly important. The Survey attempts to provide forewarning of outbreak of forest pests, and, partly in preparation for the control thereof, the bionomics of each species of forest insect.

During the talk Mr. Leech gave details of the collecting, rearing, labelling, indentification, and building up of a collection. Stress was laid on personnel problems and on the basic dependence of the work on taxonomists.

After a discussion of the paper, the meeting was adjourned.—D. D. JENSEN, *Secretary.*

One Hundred and Ninety-eighth Meeting

The one hundred and ninety-eighth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on February 28, 1948, in the entomological laboratories of the California Academy of

Sciences, San Francisco. President Michelbacher in the chair. The following members were present: A. E. Michelbacher, D. D. Jensen, K. E. Frick, D. W. Boddy, W. W. Middlekauff, E. C. Van Dyke, E. O. Essig, R. F. Smith, A. J. Walz, H. B. Leech, T. O. Thatcher, L. M. Henry, G. F. Ferris, B. D. Culver, F. E. Skinner, P. H. Arnaud, F. J. Driver, H. P. Chandler, Mrs. H. P. Chandler, W. D. Murray, C. P. Hoyt, W. W. Wirth, E. E. Seibert, C. H. Hanson, E. S. Ross, C. H. Spitzer, Jr., D. H. Bixby, P. A. Adams, A. E. Pritchard, G. L. Smith, P. D. Hurd, Jr., J. W. MacSwain, W. W. Sampson, J. W. Tilden, J. P. Harville, R. E. Beer, P. A. Harvey, J. R. Walker, R. C. Miller, W. Russell, E. L. Kessel, B. B. Kessel, H. A. Scullen, E. G. Wegenek, H. T. Reynolds, and H. H. Blakemore. Visitors were present as follows: Ruth F. Hanke, Wm. L. Hoyt, L. L. Lewallen, Mrs. J. W. Tilden, Thomas Leigh and W. A. McDonald.

The minutes of the previous meeting were read and approved.

The membership committee proposed the following for membership in the Society: Richard W. Coleman, I. Barry Tarshis, Frank A. Ehrenford, Vernon M. Stern, Francis Leigh, and Frederick Rindge. They were unanimously elected.

President Michelbacher appointed the following members as a committee to investigate possible localities for the April field trip of the Society: Mr. J. W. MacSwain (Chairman), Dr. E. S. Ross, and Miss Laura Henry. The committee is to report its recommendations at the March meeting.

The chair called for notes, exhibits, and remarks. Dr. Middlekauff displayed a new species of sawfly of the family Siricidae, collected in Berkeley, California, 1932, on white fir. This is the first new species in this family reported in North America since Bradley's work in 1913.

Mr. MacSwain reported on four egg masses of *Meloe strigulosus* Mann. laid by adults collected in the Oakland Hills between December and February. Of the eggs showing development, over 75 per cent of the larvae were abnormal. Several slides were exhibited showing many larval abnormalities including one individual from which the head and prothorax were completely lacking and which possessed only one meso-thoracic leg, the metathorax and abdomen being normal.

Mr. H. B. Leech exhibited two new entomological publications, a new book by A. D. Imms entitled "Insect Natural History" and the 44th Annual Volume of the Entomological Society of British Columbia.

Professor H. A. Scullen, a member of the Society, visiting from Oregon State College was introduced to the members present and expressed his pleasure at attending the meeting.

President Michelbacher introduced the main speaker of the meeting, Dr. W. W. Middlekauff, who presented a paper, with ac-

companying lantern slide illustrations, entitled "Bionomics of Some American Sawfly Larvae." A summary of Dr. Middlekauff's remarks follows:

With the exception of the parasitic family Orussidae, sawfly larvae are completely phytophagous. The commonest hosts are all very primitive plants and include ferns, conifers, grasses and sedges, willows, alders, hickories, oaks, and almost every native genus of Rosaceae. There are sawflies which feed on other hosts, but aside from those named, few sawfly larvae attack them. Thus only a few species feed on such specialized plant families as the Ericaceae, Caprifoliaceae, and Compositae.

A few sawfly groups are very narrowly restricted in host range. The family Diprionidae feeds only on pines, most of the subfamily Selandriinae only on ferns, and in other groups many genera are confined to a single plant genus. Conversely a few groups such as the Nematinae show a great range of host species amongst the various genera.

Sawfly larvae may be segregated into the following categories, based upon their feeding habits.

1. Free leaf feeders—majority of Tenthredinoidea and Xyelidae.
2. Leaf miners—several genera of Phyllotominae, several species of Argidae, and one species of Nematinae. Caulocampus acericaulis mines the petioles of maples.
3. Web spinners—family Pamphiliidae.
4. Wood and stem borers—Siricidae, Xiphydriidae, and Cephidae.
5. Gall makers—*Lycaotella*, *Pontania*, and *Euura*.
6. Fruit eaters—Hoplocampinae.
7. Parasitic—*Orussus*.

Larval Feeding Habits. Sawfly larvae may be gregarious or solitary in feeding habits. This is controlled to a great extent by the female and her manner of depositing eggs. It is a constant feature for a species, however. The great majority of leaf-feeding sawflies are edge feeders and many species have characteristic feeding postures. Habits of several species were discussed in detail and the manner in which the larvae of Siricidae and Cephidae prepare for their escape as adults was mentioned.

It has recently been shown that Siricidae have symbiotic fungi living in association with them. Spores of a Basidiomycete are inoculated into the egg tunnel and the developing mycelia are utilized by the larvae in digesting wood particles.

Protective glands are possessed by many species of sawflies on the external surface of their bodies which secrete fluids, slime, or wax. Examples of several types were given.

Difficulties in rearing and methods of pupation were also discussed.

At the conclusion of a discussion of the paper the meeting was adjourned.—D. D. JENSEN, *Secretary*.

One Hundred and Ninety-ninth Meeting

The one hundred and ninety-ninth meeting of the Pacific Coast Entomological Society was held at 2:25 p.m. on March 20, 1948, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Michelbacher in the chair. The following members were present: E. S. Ross, J. W. MacSwain, R. F. Smith, E. L. Kessel, B. B. Kessel, C. H. Spitzer, P. H. Arnaud, C. P. Hoyt, R. L. Doutt, L. R. Gillogly, K. S. Hagen, P. D. Hurd, Jr., K. E. Frick, W. W. Wirth, W. W. Middlekauff, P. A. Adams, D. Bixby, J. R. Walker, C. Donald Grant, B. D. Culver, J. F. Gustafson, L. M. Henry, A. E. Pritchard, W. D. Murray, D. W. Boddy, J. P. Harville, E. A. Smith, J. W. Tilden, G. F. Ferris, E. O. Essig, H. B. Leech, E. C. Van Dyke, B. Walker, C. D. Duncan, R. L. Usinger, A. E. Michelbacher, and D. D. Jensen. The following visitors were present: S. R. Hildebrandt, V. M. Walker, H. S. Elmer, W. L. Kaiser, Jr., A. G. Applegarth, Mrs. E. A. Smith, and Mrs. J. W. Tilden.

The minutes of the previous meeting held February 28, 1948, were read and approved.

The membership committee proposed and the Society unanimously elected Lawrence L. Lewallen and W. C. Day as members of the Society.

Reporting for the committee assigned to select a locality for the April field trip, Mr. MacSwain stated that Rock City, Mt. Diablo had been chosen as the site for the outing. The date proposed was Sunday, April 18, 1948.

By a unanimous vote of the members present, Dr. Usinger was authorized to serve as the official representative of the Pacific Coast Entomological Society at the 13th International Congress of Zoology to be held at Paris, France, July 21 to 27, 1948, and also at the 8th International Congress of Entomology at Stockholm, Sweden, August 9 to 14, 1948.

The chairman then called for notes, exhibits and remarks.

Dr. E. L. Kessel exhibited three live male specimens of *Empimorpha geneatis* Melander (Empididae) (see Pan-Pacific Ent. 23: 181-192) and the small white balloon each had been carrying at the time of capture. They had been collected near Monterey Pines at Mill Valley, California, and were kept alive in the hope that they would still be holding the balloon at the time of the meeting. However, each had dropped its balloon by releasing the single, small hymenopteron or dipteron which adhered to the balloon and which served *E. geneatis* as a handle in carrying the balloon.

Mr. Gillogly exhibited examples of "Kodagraph" contact paper which can be used in copying published articles. The paper is merely placed over the page, exposed to light, and developed. The result is a negative which can be used in making a positive print

or can be read from the back by holding the negative between the reader and a light source.

Professor Ferris stated that the work which Miss Laura Henry has been carrying out on the nervous system of the lower invertebrates has elucidated the question regarding the origin of the hypopharnyx in insects. Her work on the nerves shows that the hypopharynx belongs to the second or clypeal segment. The evidence to support this conclusion is consistent all the way from the oligochaete worms up through the Crustacea to and including the insects.

Dr. Usinger reported that Dr. Richard Goldschmidt, of the University of California, has been rearing *Drosophila* flies which bear extra appendages on the legs. Among the aberrant individuals produced was one with the prothoracic legs fused in such a manner that they simulated a perfect labium showing the mentum, submentum, palpus, etc.

Dr. Ross announced that the Society's pamphlet collection became depleted when everything on hand was sent to the Philippine Islands to help rebuild the library at Los Banos which was destroyed during the war. Previously miscellaneous pamphlets which were turned in to the Society could be purchased by members at a low cost.

President Michelbacher introduced, as the main speaker of the meeting, Mr. J. W. Tilden of Stanford University who spoke on the subject, "The Insect Fauna of *Baccharis pilularis*." *Baccharis pilularis* De Candolle is a dioecious fruticose composite, described in 1836, apparent type locality San Francisco. According to C. B. Wolf, 1935, it occurs in two subspecies: *typica* Wolf, the prostrate coastal form, and *consanguinea* De Candolle, the taller inland form. However, both subspecies occur together, and are genetic segregates. As a species, *pilularis* is invasive, pioneering disturbed areas, and is inclined to form "microsavannahs" in grasslands.

Its seasonal growth is correlated with the amount of available water in the soil, and maximum seasonal growth occurs during the rainy season, beginning in the late fall and extending into June. The maximum insect populations on the plants coincide with this period of greatest growth.

The total complex of insects found to be associated with *Baccharis pilularis* is 226 species. Of these, 165 species are dependent to a greater or lesser extent upon the plant or upon other species of insects that are so associated. Percentages of orders and types of life habits were presented for the insects composing this group of species.

Food chains and food cycles were discussed, and three were presented in some detail. In the cycle of which *Gnorimoschema baccharisella* Busck is the basic or "key" industry, it was found that there are ten primary parasites, two secondary parasites, and one tertiary parasite of this moth. In addition to the moth and its

parasites, ten species of other insects are associated with the gall of *baccharisella*, utilizing it for food and shelter.

Other aspects of this complex of insects were discussed, including competition, dominance, inquilines, and phenology. It was noted also that certain species exhibit a sense of territory and at least one species makes daily altitudinal movements. There is an interaction among the members of this complex, and the included members may be regarded as constituting a community, although not in the strictest classical sense of the word.

After a discussion of the paper, the meeting was adjourned at 4:00 p.m.—D. D. JENSEN, *Secretary*.

Two Hundredth Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Mt. Diablo, Contra Costa County, California, on April 18, 1948.

The recorded attendance was 97 persons. The following 36 members were present: D. Raski, M. W. Allen, D. D. Jensen, E. E. Siebert, W. W. Wirth, P. D Hurd, Jr., Deane Furman, R. L. Usinger, Francis Leigh, H. F. Madsen, K. E. Frick, F. H. Rindge, N. W. Hazel, D. W. Adams, J. W. MacSwain, R. G. Wind, J. P. Harville, I. B. Tarshis, U. N. Lanham, J. W. Tilden, E. A. Smith, J. R. Walker, M. Marquis, H. B. Leech, D. H. Bixby, P. A. Adams, E. O. Essig, A. E. Michelbacher, W. W. Middlekauff, W. H. Hart, R. M. Bohart, W. C. Day, W. H. Lange, A. T. McClay, A. E. Pritchard, and H. E. Cott. Thirty-eight adult visitors and 23 children were present as follows: Mrs. D. Laski, Mrs. M. W. Allen, Mrs. D. P. Furman, K. Sakimura, R. D. Carter, Mrs. R. L. Usinger and family, Mr. and Mrs. Bertram Leigh, Mr. A. Bartel, Mrs. N. Hazel, Mrs. D. W. Adams, Mr. Eric C. Winkler, Mr. A. S. Tahon, Mrs. A. E. Pritchard and family, Mrs. W. W. Wirth and family, Mrs. J. P. Harville, Mrs. W. H. Hart, Mr. and Mrs. H. Zaiman, Mrs. I. B. Tarshis, Mrs. W. W. Middlekauff and family, Mrs. K. E. Frick, Mrs. H. F. Madsen and family, Mrs. M. Texeira, Mr. D. V. Welsch, Mrs. J. W. Tilden, Mrs. J. R. Walker and family, Mrs. E. A. Smith and family, Mrs. M. Marquis, Mrs A. E. Michelbacher, Mrs. M. Mauerhan, Mrs. H. B. Leech and family, Mr. J. W. Quail, Mrs. D. D. Jensen and family, Mrs. R. M. Bohart, Mrs. W. C. Day and family, Mrs. W. H. Lange and family, and Mrs. A. T. McClay.

The spring season of 1948 was approximately two weeks later than normal, and the weather for several weeks prior to April 18 had been cold and stormy. However, on the day of the field meeting the sun was shining and the air was warm and relatively still at Rock City. The members of the group enjoyed themselves by collecting, hiking and visiting.—D. D. JENSEN, *Secretary*.

Two Hundred and First Meeting

The two hundred and first meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on October 23, 1948, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Michelbacher in the chair. The following members were present: W. C. Day, E. C. Van Dyke, W. Harry Lange, J. W. MacSwain, H. B. Leech, Herbert Blakemore, J. W. Tilden, E. G. Wegenek, A. E. Pritchard, W. D. Murray, K. S. Hagen, Laura M. Henry, R. W. S. Potts, L. L. Lewallen, P. H. Arnaud, C. P. Hoyt, K. E. Frick, F. H. Rindge, W. W. Wirth, Bernard Brookman, E. S. Ross, S. E. Hall, Jr., P. D. Hurd, Jr., D. B. Scott, E. G. Meyers, J. R. Walker, E. A. Smith, C. H. Spitzer, C. D. Duncan, P. A. Adams, A. W. Larson, A. E. Michelbacher, D. D. Jensen, B. D. Culver, and E. G. Linsley. Visitors were present as follows: K. W. Tucker, W. K. Bauman, S. A. Sher, L. W. Quate, Iris Wegenek, R. F. Fritz, A. H. Bartel, Wm. Hazeltine, J. M. Watson, Claude Smith, R. L. Langston, J. E. Gillaspy, N. D. Waters, S. E. Hall, Jr., Douglas Gould, Bernard Gardner, Mrs. E. A. Smith, N. G. Gratz, Patricia Readnig, Sylvia R. Hildebrant, Pauline S. Lange, Victor Stombler, J. Gordon Edwards, G. Carter, and Andrew Browne.

The minutes of the meeting held February 28, 1948, and of the field meeting held April 18, 1948, were read and approved.

The membership committee proposed and the Society unanimously elected the following as members of the Society: Dr. Francis X. Williams, Phyllis Johnson, Harold S. Elmer, Stanley H. Benedict, Samuel A. Sher, Don W. Adams, Douglas Gould, J. Gordon Edwards, Wilfred K. Bauman, Walter E. Kelson, Larry Quate, James E. Gillaspy, John F. Hart, R. S. Beal, Jr., Eugene Morris, Victor Stombler, John M. Watson, Arthur Retan and William Hazeltine.

President Michelbacher called attention to the fact that the 50th anniversary of the Society will occur in less than two years and that plans should be made to commemorate the occasion appropriately.

Dr. Linsley, a member of the Nomenclature Committee, at the request of the president, reported the results of the meetings held by the International Commission on Zoological Nomenclature at the 13th International Congress of Zoology held at Paris, France, July 21 to 27, 1948.

President Michelbacher appointed the following members to serve as a Nominating Committee to select a slate of proposed officers for the year 1949 to be presented at the December meeting: Dr. R. F. Smith (Chairman), Dr. C. D. Duncan and Dr. E. C. Van Dyke.

The president then called for notes, exhibits and remarks.

Mr. MacSwain exhibited a gynandromorph of *Xylocopa orpifix*, on which the left side was male and the right side was female

all the way through the body from the anterior end to the posterior end.

Mr. Tilden displayed a photomicrograph of the genitalia of *Caicella mysie* (Dyar), a hesperiid. The picture was taken by a special process, originated by Lester Brubaker of San Jose State College, which shows promise of facilitating some types of entomological illustration.

Mr. E. A. Smith exhibited a case of mutillid wasps (*Dasymutilla* spp.) which had been collected near Los Banos, California, where they were eating the bracts of Australian saltbush, *Atriplex semibaccata* R. Br.

Mr. Frick reported the following observations, made during the past summer in California, on an unusual feeding habit of the predaceous larvae of *Chrysopa* sp. At Mount Herman a chrysopid larva was found feeding on a half-emerged larva of a species of *Dizygomyza* (Agromyzidae). The fly larva was cutting its way out of its mine on the lower surface of a Brackin fern leaf.

At Hope Valley, Alpine County, a chrysopid larva was found with the ends of both mandibles projecting through the lower surface of a leaf of *Lonicera conjugialis*. Microscopic examination showed the mandible holes were located on either side of an agromyzid mine, but no fly larva occurred at this spot. This may have been random searching.

At the summit of Luther Pass, El Dorado County, a chrysopid larva was found on the lower surface of a leaf feeding on a large larva of *Pegomyia* sp. (Anthomyiidae). Both mandibles penetrated the lower leaf surface and were imbedded in the prey. Subsequent examination under a binocular microscope revealed a shrunken larva at the feeding site. This species of *Pegomyia* makes large blotch mines in *Polygonum alpinum*.

On *Symphoricarpos albus* (snowberry), on the Berkeley campus, a chrysopid larva was observed attempting to feed upon an old puparium (*Phytomyza* sp. from which the adult agromyzid had already emerged. The chrysopid larva repeatedly opened and closed its mandibles on the puparium, each time in a different place. Since the puparium occurred beneath the upper epidermis of the leaf, the chrysopid larva may have found it by random searching.

Three of the four *Chrysopa* larvae were subsequently reared to the adult stage by feeding them on aphids.

The president presented Dr. W. Harry Lange, Jr., of the University of California, who gave an illustrated talk on "Entomological Observations in the Pacific and Malaysian Areas." A summary of his remarks follows:

The Pacific Science Board of the National Research Council has initiated a number of insect control projects at the request of the navy. The primary purpose of the work is to control insects

or other organisms seriously damaging crops which are of greatest economic value to the natives. One of these projects was a joint one dealing with the life histories and controls of the Mariana coconut beetle, *Brontispa mariana* Spaeth, and the giant African snail, *Achatina fulica* Ferussac. The project began in October, 1947, and extended until the end of March, 1948. After a period of one month on Saipan a search was made for parasites of the coconut beetle in the Philippines, Malaya, and Java. In the Philippines a search in the vicinity of Los Banos, Luzon, revealed no parasites of possible value, although *Plesispa reichei*, an externally-feeding hispid, and *Promecotheca cumingi*, a leaf miner of coconut were found. In Malaya, headquarters were established at Kuala Lumpur where two entomologists are stationed, H. T. Pagden, and R. A. W. Lever. The genus *Brontispa* does not occur in Malaya, but several parasites of other externally feeding hispids were found. An egg parasite of *Plesispa nipa* on nipa palm, *Haeckeliana brontispae* Ferr., was found parasitizing 60 per cent of the eggs of this beetle near Klang. A pupal parasite of *Plesispa nipa* was found, *Tetrastichus brontispae* (Ferr.). On *Wallacea palmarum* feeding on Chinese betel nut, a parasite was found emerging through the mature larva, namely, an *Achrysocharis* sp. Several other parasites were obtained from individual rearings. Of these parasites, *Haeckeliana brontispae* and *Testrastichus brontispae* were successfully introduced to Saipan. A trip was made to Java to study the parasites of *Brontispa longissima javana* and *B. longissima selebensis*, which occur together on coconuts and cause damage to coconuts in a similar manner to *B. mariana*. The Dutch under Dr. van der Vecht successfully bred *Tetrastichus brontispae* for introduction to Celebes before the war, and they cooperated by breeding parasites for this project. About 600 parasitized beetle pupae containing *T. brontispae* were successfully brought to Saipan, and a few *Haeckeliana brontispae* for laboratory work. Both parasites were found to select *Brontispa mariana*, although it was difficult to rear the egg parasites and a high mortality occurred. Approximately 4,000 *Tetrastichus* parasites were liberated on Saipan and several hundred on Rota. About 300 *Haeckeliana* egg parasites were also liberated on Saipan and a few on Rota.

According to a recent survey by Dr. Richard Doutt the pupal parasite, *Tetrastichus brontispae* was found to be successfully established in six of seven localities on Saipan and gave evidence of having experienced some degree of natural spread. The egg parasite was not found, although there was evidence that it went through one generation before disappearing.

In Malaya, Mr. T. R. Gardner collected a scoliid wasp, *Scolia patricialis* var. which was introduced into the Palau Islands for control of the rhinocerus beetle. *Scolia procer* was reported in the literature on *Orcytes* in Malaya, but this wasp was found to probably select other woodboring grubs and not *Oryctes*.

On Saipan a study was made of the life history of the giant African snail, but time was not available for a complete study The life history varies apparently with climatic conditions and available food On Saipan snails are most active during the rainy season, at which time mating and egg laying occur. The snails are catholic in their tastes, feeding on all types of vegetation, dried leaves, fruits, and even manure.

The snail is successfully controlled in larger areas through the use of pelletted snail baits. Dr. F. X. Williams was sent to Africa to secure parasites and predators and was able to find several predacious snails, a large predacious carabid beetle, and a fly parasite.

After a discussion of Dr. Lange's talk the meeting was adjourned.—D. D. JENSEN, *Secretary.*

Two Hundred and Second Meeting

The two hundred and second meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on December 18, 1948, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Michelbacher in the chair. The following members were present: E. C. Van Dyke, C. A. Hanson, E. G. Wegenek, F. X. Williams, H. M. Armitage, R. C. Miller, J. W. MacSwain, E. L. Kessel, W. W. Middlekauff, E. G. Linsley, L. W. Quate, C. H. Spitzer, Jr., J. W. Tilden, L. L. Lewallen, P. H. Arnaud, Jr., C. D. Duncan, B. E. Rees, L. R. Gillogly, R. P. Allen, A. W. Larson, J. Gillaspy, W. W. Wirth, Ernestine B. Thurman, D. C. Thurman, A. E. Pritchard, D. D. Jensen, J. F. Hart, A. E. Michelbacher, and E. E. Seibert. Visitors present were Sylvia R. Hildebrant and G. F. Carter.

The minutes of the meeting held October 23, 1948, were read and approved.

The membership committee proposed and the Society unanimously elected the following as members of the Society: Norman G. Gratz, Roy. F. Fritz, Roberto Levi Castillo, G. F. Carter, D. C. Thurman, Ernestine B. Thurman, John J. Roland, Omar E. Myers, Norman D. Waters, Claude I. Smith, Rudolf H. T. Matton, Howard Greenfield, C. F. Adams, G. F. Augustson, James Baker, H. G. Barber, Herbert S. Barber, J. C. Bequaert, F. Martin Brown, L. R. Cody, John F. Curry, W. M. Davidson, Heber C. Donohoe, R. R. Dreisbach, J. W. Green, Harry A. Hill, George F. Knowlton, Frank H. Lathrop, Borys Malkin, Don C. Mote, Herbert Osborn, Wm. Proctor, L. P. Rockwood, Herbert Ruckes, E. Graywood Smyth, Stanley Watkins., Raymond G. White, and Kent H. Wilson.

President Michelbacher called on Dr. Linsley who reported that the Nomenclature Committee is in correspondence with Mr. Hemming, Secretary of the International Commission on Zoological Nomenclature regarding the proposed revision of the International Rules.

Dr. Miller gave the Treasurer's report on the finances of the Society. Dr. Rees reported that the auditing committee had found the Society's financial records in good order.

Mr. Armitage stated that the selection of Oriental fruit fly as the common name of *Dacus dorsalis* Hendel, recently established in Hawaii, was unfortunate because of the possibility of confusion with the name Oriental fruit moth. He also questioned the desirability of having official common names of insects decided upon by a committee of ten entomologists appointed by the American Association of Economic Entomologists.

Dr. Linsley reviewed the history of the Committee on Common Names and suggested that advance publication of proposed names would give the committee the benefit of public reaction before making the final selection of a name.

In response to the President's call for notes, exhibits and remarks, Dr. Kessel stated that a loose leaf system of color identification is now available which permits relatively definite determination of any color which one may encounter.

Mr. Armitage reported on some of the insect records established by the California Department of Agriculture during 1948. Included were notes on the walnut huskfly, the navel orangeworm, olive scale, chrysanthemum insects, and the Australian sod fly. The sod fly was recently discovered in North America for the first time when it was found in San Francisco by Dr. Kessel.

President Michelbacher, reporting on the state of the Society during 1948, announced the unexpected death of one of the younger members, Mr. Loren Estabrook who died December 1, 1948, at Stockton, California, during a tonsillectomy. A summary of membership in the Society during recent years revealed an increase in membership from 119 in 1940 to 251 in 1948. The average attendance per meeting during 1940 was 29 and during 1941 it was 31. During the war years of 1942-1945 attendance averaged only 17 per meeting. In 1946 and 1947 attendance averaged 47 and 43 respectively. Attendance at the first five meetings during 1948 increased to an average of 60 members and friends per meeting.

Dr. Duncan, representing the nominating committee, proposed and the Society elected the following officers for 1949: E. S. Ross, President; G. F. Ferris, Vice-President; D. D. Jensen, Secretary; R. C. Miller, Treasurer; and E. L. Kessel, Executive Board Member at Large.

In the absence of both the president elect and vice-president elect, President Michelbacher turned the meeting over to Dr. Jensen. President Michelbacher was then called on to give his retiring presidential address entitled "The Ecology of Symphyla." (This address will be published in full in the Pan-Pacific Entomologist.) After considerable discussion of the paper, the meeting was adjourned.—D. D. JENSEN, *Secretary.*

The Pan-Pacific Entomologist

Vol. XXV, No. 2 April, 1949

NEW SPECIES OF NORTH AMERICAN COLEOPTERA

BY EDWIN C. VAN DYKE
California Academy of Sciences, San Francisco

CARABIDAE

Nebria intermedia Van Dyke, new species

Of moderate size and rather robust, rufopiceous, the head and disc of pronotum piceous the antennae, legs, lateral margins of prothorax and elytra as well as sutural intervals of elytra rufous. Head five sixths breadth of prothorax, eyes rather prominent though less than hemispherical, antennae long and delicate, reaching at least four segments posterior to humeral angles of elytra, the pair of light colored spots between the eyes rarely present or if so faint. Prothorax two thirds as long as broad, less than three fourths as broad as elytra, apex feebly biemarginate, apical angles prominent, sides broadly, evenly arcuate in front, obliquely narrowed and feebly sinuate posteriorly, the hind angles prominent and obtuse though sharply pointed, basal margin transverse; the disc convex with the median longitudinal and anterior and posterior transverse impressions well defined, the latter punctured, and the basal area finely rugosely punctured, the lateral margins broad and moderately reflexed. Elytra square shouldered, parallel sided, about three times as long as prothorax, the disc more or less flattened, striae well impressed, finely and in most cases obscurely punctured, the intervals in general quite flattened, the third with four or sometimes five foveae close to the third stria, the humeral angles rounded and prominent, lateral margin narrowly reflexed. Legs long and delicate. Wings fully developed, and as long as entire beetle. Length 10 mm., breadth 4.25 mm.

Holotype male, *allotype* female, Nos. 6008 and 6009 C.A.S. Ent., and eleven paratypes collected by myself in the LOGAN PASS, GLACIER NATIONAL PARK, MONTANA, July 8, 1938. Besides these I have a series of close to a hundred specimens of the same species from various places in the northern Rocky Mountains of Montana, Alberta and British Columbia as well as from the more elevated areas of south central British Columbia and Mr. Bonaparte in Okanagon County, Washington.

This species superficially looks much like *Nebria labradorica* Casey and was for some time confused with it. It differs primarily from *labradorica* in being more graceful, less compact, with less

pronounced frontal impressions, the prothorax with the sides less broadly rounded in front, more gradually narrowed and sinuate posteriorly, with the hind angles feebly obtuse, not with the sides suddenly constricted and with the hind angles definitely right angled as is the case with most *labradorica*. The elytral foveae are also in general less marked. From *Nebria crassicornis* Van Dyke, of the high northern Cascades, which it also somewhat resembles, it differs by being less robust, with the antennae longer and finer, the head and prothorax considerably smaller especially as regards breadth and by having the sides of prothorax not suddenly constricted behind and the hind angles right angled. All three have the same greasy, rufo-piceous appearance.

Schizogenius peninsularis Van Dyke, new species

Medium sized for the genus, narrow, sybcylindrical, piceous, the pronotum and elytra aeneous, and the antennae and legs rufous. Head with clypeus tridentate, front with three lateral longitudinal sulci and a broader median sulcus narrowed in front; eyes moderately prominent; antennae rather short, moniliform, reaching to about middle of prothorax, the segments sixth to tenth transverse. Prothorax convex, subquadrate, narrowed forwards, the median, lateral and anterior transverse grooves well marked, the lateral barely reaching middle of pronotum and slightly convergent, two lateral setae, one near front angles and the second (sometimes absent) near hind angles. Elytra convex, about three times as long as broad, striae deeply impressed and rather closely, coarsely punctured from base to declivity, the intervals convex, the third, fifth, and seventh with a few fine setiferous punctures. The anterior tibiae more or less palmate, with three outer blunt and two inner acute teeth. Length 5 mm., breadth 1.5 mm.

Holotype, No. 6010, C.A.S. Ent., and several designated paratypes from 5 miles south of MIRAFLORES, LOWER CALIFORNIA, July 10, 1938, collected by Michelbacher and Ross. Besides these in the series of twenty three are others from Triumfo, July 7, 1938, and 5 miles west of San Bartola, July 13, 1938, likewise collected by Michelbacher and Ross.

This species superficially resembles several in our fauna such as *lineatus* Say and *litigiosus* Fall but these species are in general larger, a bit broader and flatter, with longer antennae which have the median segments longer than broad. This species also seems to be even more closely related to the Mexican *truquii* Putzeys, but the description of this omits to mention certain characters which would be needed to confirm the surmise.

Rhadine rossi Van Dyke, new species

Rather small and gracefully formed with long delicate antennae and legs, pale rufocastaneus, unicolorous. Head about a sixth longer than broad, somewhat elliptical in shape, the disc smooth, with feeble lateral rugose longitudinal impressions, the mandibles porrect and quite prominent, projecting but slightly beyond the sides of head; the basal region short and with oblique sides; antennae long, extending almost to middle of elytra, the third segment about one fourth longer than fourth. Prothorax cordate, slightly longer than broad, apex feebly emarginate, with anterior angles acutely rounded and feebly extending forwards, the sides broadly arcuate in front, oblique and convergent from posterior third to hind angles which are small though distinct, right angled and elevated, base deeply emarginate, the disc convex, smooth and shining, the median longitudinal and posterior transverse impressions distinct, the sides deplanate, the lateral margin rather broadly reflexed. Elytra elongate elliptical, a third longer than broad, feebly convex, finely striate, the striae shallowly but distinctly impressed and finely, somewhat obscurely punctured, intervals quite flat, the third sometimes with a few vague foveae, the apices obliquely sinuate, the sutural angles short and divergent, the submarginal punctures numerous and distinct, and the lateral margin rather broadly reflexed. Front tarsi with distinct median groove above, the middle and hind with less distinct median grooves but also with lateral grooves. Length 10 mm., breadth 4 mm.

Holotype male, *allotype* female, Nos. 6011 and 6012, C.A.S. Ent., and numerous designated paratypes from a series of 97 specimens trapped in pocket gophers (*Geomys*) burrows near SOMERSET and SAN ANTONIO, TEXAS, during November, 1942, by Dr. E. S. Ross and A. J. Kirn.

This species resembles *Rhadine myrmecodes* Horn, but the large series which has been studied shows that there are constant differences such as being a bit broader as regards both prothorax and elytra, more shining, *myrmecodes* being sub-opaque and alutaceous, with the third antennal segments more uniformly much longer than the fourth segments, the sides of prothorax almost straight and convergent behind instead of distinctly sinuate, the hind angles generally with a small everted tooth at apex, lacking in the other, the elytra with the apical sinuosity more abrupt and marked and the sutural spines less acute and shorter. Its distribution is more to the east, eastern Texas, whereas *myrmecodes* is from the regions to the west, generally Arizona. It might be considered as a subspecies, but I think that until we have more intermediate forms from intermediate territory, it is best to keep them apart.

Rhadine longiceps Van Dyke, new species

Small, narrow, with long and delicate legs and antennae, piceous, subopaque, legs and underside lighter, the palpi and antennae rufous. Head fully a third longer than broad, the frontal impressions deep and rugose, the mandibles prominent and porrect; the eyes feebly convex; the post occipital area fully as long as the head in front of eyes and with sides oblique and converging to the narrow neck; antennae long, extending to the middle of elytra, the third segment about one fourth longer than fourth. Prothorax elliptical, almost a third longer than broad, apex feebly emarginate, the apical angles rounded but not prominent, the sides broadly arcuate in front, almost straight and convergent to hind angles which are obtuse, basal margin feebly emarginate, the disc convex, smooth and shining, the median longitudinal impression distinct, the posterior transverse not well defined, the sides somewhat deplanate, the side margin broadly reflexed. Elytra elliptical, almost twice as long as broad, feebly convex, the striae very fine, feebly impressed, very finely, obscurely punctured at best, the intervals quite flat, alutaceous, the third with several foveae close to the third stria, the apices obliquely, gradually sinuate, the sutural angles divergent, short and right angled, the submarginal punctures distinct but not deeply impressed, the lateral margin broadly reflexed. The front, middle and hind tarsi with distinct median groove, the middle and hind also with lateral grooves. Length 10 mm., breadth 4 mm.

Holotype female, No. 6013, C.A.S. Ent., and two *paratype* females, collected by Dr. E. S. Ross, from beneath stones, 10 miles west of ALPINE, TEXAS, November 28, 1946.

This small, narrow and dark species is quite distinct. Its head simulates that of *longicollis* Benedict, a subterranean species from the Carlsbad caverns of New Mexico, otherwise unrelated, its prothorax is narrow and elliptical, not cordate like that of *myrmecodes* Horn and its small relatives, and its elytra are also elliptical. Its dark piceous color is also in contrast to the rufo-castaneous color of the more or less subterranean species.

CEBRIONIDAE

Cebrio pallidipennis Van Dyke, new species

Moderately elongate, depressed, parallel sided, head and pronotum, except basal margin and underside piceous; base of prothorax, elytra, antennae, mouthparts and legs testaceous, and very sparsely clothed with short and closely appressed pile. Head rather coarsely, closely punctured with a somewhat triangular

shaped pit at the center of an impression between the eyes, labrum broadly emarginate in front, eyes prominent; antennae serrate, reaching two segments beyond hind angles of prothorax, second segment small and transverse, the third small and triangular, the fourth to tenth strongly serrate. Prothorax broader than long, apex slightly arcuate, sides feebly rounded in front, the hind angles small, triangular and divergent, the disc convex and rather coarsely, densely punctured. Elytra twice as long as wide, the striae distinctly impressed and regular with the strial punctures toward the middle coarse and regularly arranged, the odd intervale quite convex, the even more flattened except at base, and finely, irregularly punctured. Beneath finely punctured and clothed with short fulvous pile with the prothoracic intercoxal process rather broad. Length 11 mm., breadth 4 mm.

Holotype, No. 6014, C.A.S. Ent. and five *paratypes* collected at TUBA CITY, ARIZONA, July 4 and 3. 1937, by R. P. Allen and kindly presented to the Academy. Besides the six specimens mentioned above there are two specimens collected at the same time and place which are entirely testaceous except the head, otherwise not different. I consider these merely color phases.

This species is eminently a desert species and its color indicates it. Because of this its appearance is entirely different from that of any other in our fauna.

BUPRESTIDAE

Acmaeodera lucia eburna Van Dyke, new subspecies

Small, short, moderately convex and compact, aeneous except hind angles of pronotum where there is a large yellow patch and the elytra which are ivory colored except for a narrow sutural line and the humeral umbone which are black, the upper surface clothed with a moderately dense, erect pale pile. Head coarsely, densely punctured, feebly longitudinally impressed at middle, antennae short, hardly reaching the middle of prothorax, the segments 5-11 serrate. Prothorax two fifths broader than long, apex feebly biemarginate, sides rather evenly arcuate from base to apex, the margin very fine, concealed behind when viewed from above by sides of pronotum; the disc quite convex, coarsely, cribrately punctured at sides, more discretely at middle, a shallow median longitudinal impression with a distinct puncture at the base, and a narrow transverse impression behind the apical margin. Elytra slightly narrower at base than prothorax, about twice as long as broad, sides very feebly sinuate in front of middle and gradually arcuate and narrowed to blunt apex; the disc quite convex, feebly flattened at middle, the humeral umbone distinct, the striae distinct at sides, feeble towards suture and rather

coarsely regularly punctured, the intervals finely punctured and rugose, the sides serrate near apex. Beneath rather coarsely, densely punctured. Prosternum very feebly, broadly emarginate in front. The last ventral segment with a small transverse lobe like plate before apex. Length 7 mm., breadth 2.5 mm.

Holotype, No. 6015, C.A.S. Ent. and numerous designated *paratypes* from a series of 32 specimens collected by myself 25 miles east of BAKER, CALIFORNIA, June 24, 1948. They were swept from the salmon colored flowers of a species of mallow, *Sphaeralcea*, probably *ambigua* Gray. Other specimens have been designated as paratypes from the collection of Mr. Burdette E. White, my companion on the trip who secured an even greater number of specimens than I did.

This subspecies is quite different in appearance from typical *lucia* Fall and the large series of specimens taken in one locality which has the elytra practically immaculate, a few specimens only having limited markings, seem to set it apart.

DRYOPIDAE (ELMINAE)

Simsonia giulianii Van Dyke, new species

Elongate, subparallel, shining, piceous, the head and pronotum aeneous, the elytra with a light yellow humeral spot generally prolonged for a short distance obliquely backwards and inwards and a yello apical vitta extending obliquely backwards and inwards from slightly behind the middle towards the suture and apex but not reaching the latter; the upper surface sparsely, finely pubescent. Head coarsely, sparsely punctured; antennae not quite reaching hind angles of prothorax. Prothorax about one seventh broader than long, apical lobe distinct, sides feebly arcuate posteriorly, almost straight and convergent forwards; the disc convex with coarse well spaced punctures; lateral margins narrow and distinct, the front and hind angles prominent. Elytra not quite twice as long as wide, sides straight in basal two thirds and feebly diverging backwards, thence broadly rounded and oblique to apex. The disc evenly convex, the striae hardly observable but the stria punctures rather coarse, regularly arranged and equal in width to the intervals, the intervals flat and with a few minute punctures. Beneath more or less rufopiceous, the antennae and tarsi entirely rufous, the prosternum coarsely punctured, anterior abdominal segments more sparsely so and abdomen as a whole alutaceous. Length 2.25 mm., breadth .75 mm.

Holotype, No. 6016, C.A.S. Ent., and numerous designated *paratypes* from a series of 88 specimens collected at RIO NIDO

on the RUSSIAN RIVER, SONOMA CO., CALIFORNIA, August 8, 1948, by D. Giuliani and kindly presented to me.

This species is rather closely related to *Simsonia brunnescens* (Fall) from Clear Lake, Lake Co., Calif. This latter is in most cases of a uniform brown color, proportionally longer, the elytral punctures coarser, generally as wide as intervals and more irregular, less parallel with the punctures in the adjacent rows. The distinctive features of *giulianii* are the color pattern, head and pronotum aeneous, and elytra piceous with basal and anal markings, sometimes united.

EROTYLIDAE

TRIPLAX ANTICA LECONTE

Recently Mr. Gordon Stace Smith of Preston, British Columbia, has submitted through Mr. Hugh Leech, a series of fifty two specimens of this long uncollected and desirable species. About a third of the specimens are more or less typical, with a black pronotum, piceous or dark head, and black elytra with rufous or fulvous base and black undersides. The remainder are atypical with the head, pronotum and base of elytra rufous and the underside of head and prothorax also rufous while the apical portion of elytra and abdomen are black. This species was first collected by Mr. George Gibbs of the Northwest Boundary Commission, at Sinyak water depot, presumably east of Fort Colville, now in the State of Washington, as all of the other specimens submitted by Mr. Gibbs were from "East of Fort Colville." Preston, British Columbia, is only a short distance northeast of Fort Colville and in the same biological territory.

CURCULIONIDAE

Panscopus remotus Van Dyke, new species

Of moderate size, robust, the upper surface clothed with small, closely applied chocolate brown scales with here and there a few lighter colored scales as on the sides of prothorax and in a vague arc extending backwards from the humeri, and in addition numerous short, recurved setae; and the undersurface likewise clothed with scales of larger size and with the gray scales in greater numbers and with a few short, inclined hairs. The head broad between the eyes, the eyes large but much flattened, the rostrum broad, feebly grooved above and about as long as prothorax; the antennae stout the scape reaching the eyes, the funicle with the first seg-

ment about twice as long as broad, the second somewhat longer, the third barely longer than broad and the following about as long as broad or somewhat transverse, and the club fusiform. The prothorax as broad as long, coarsely rugose above, with a well impressed median longitudinal sulcus and with sides broadly rounded. The elytra twice as long as prothorax, cordiform, base feebly emarginate, the striae well defined and with coarse, well spaced punctures, the odd intervals convex, prominently elevated and with an irregular double row of short recurved setae, the even intervals flattened in front, feebly convex behind and with a single row of recurved setae. Hind tibia practically straight. Length 9 mm., breadth 4 mm.

Holotype No. 6017, C.A.S. Ent., a unique from the TAQUITZ VALLEY, SAN JACINTO MTS., CALIF., June 14, 1939, collected by Dr. E. S. Ross on lupine.

This species has the general appearance of *Panscopus abruptus* and the flattened even numbered elytral intervals, especially basally, but is otherwise more like *rugicollis* Buchanon chiefly as regards the short broad rostrum, the deeply impressed median longitudinal prontoal impression, the convex elytral intervals, the even numbered ones almost as greatly elevated as the odd numbered and all bearing rows of short recurved setae. It appears to be intermediate structurally between the two species which are also to be found much farther to the north.

NOTES ON BEMBIDION

In 1925, I described a carabid beetle as *Bembidion coerulescens* Van Dyke. In 1928, Csiki in his catalogue substituted the name *vandykei* as the first name was preoccupied in the genus. This was unfortunate, as Dr. Blaisdell had in 1902 used the name *vandykei* for another species of *Bembidion*. To replace both *coeruluescens* Van Dyke and *vandykei* Csiki, I now propose the name *umbraticola* Van Dyke.

When I described *Bembidion utahensis* in 1925, I tentatively placed it in the genus *Lymneops* and near *laticeps* Lec. Restudying it and with more material, I now find that it belongs in the subgenus *Amerizus* of *Bembidion* and close to *oblongus* Mann. As compared with *oblongus*, the eyes of *utahensis* are much less prominent, the prothorax less narrowed behind, and the elytra less broadly elliptical.—EDWIN C. VAN DYKE.

SIX NEW MEXICAN MITES OF THE SUBFAMILY RHIZOGLYPHINAE[1]

(Acarina)

BY H. H. J. NESBITT
Ottawa, Canada

In this paper are described six new mites that Dr. F. Bonet of Mexico City collected from different parts of his country. Three of these are, in the opinion of the writer, well characterized new species; one in fact is represented by three subspecies from different localities. The other two are considered subspecies of already described species rather than new species because, the characters which distinguish them and which may be used to separate them from the latter are much less distinct and noticeable than are usually to be found between closely related species in this genus (*Caloglyphus*). Subsequent collecting and additional work, however, may show that some or all of the mites herein given the rank of subspecies are in reality either true but feebly characterized species, or geographical races of widely distributed forms.

Some explanation should be offered for the method used in arriving at the measurements given for the different parts of the body. The figure for the length of the body proper does not include the chelicerae but rather is taken from the anterior margin of the propodosoma (just anterad of the rostral setae) to the posterior margin of the opisthosoma. Similarly the figures given for the leg and tarsus do not include the claw but instead are taken from the distal end of the supporting rami of the claw to either the coxal border of the trochanter in the case of the leg or the proximal border of the tarsus when this last member is being measured. In deriving the formula for the dorsal chaetotaxy, seta 4c[2] is taken as the basal measurement because it varies very little in relative length from species to species, and the lengths of the other setae are compared either directly or indirectly to it. In the formula, setae 5 and 7 are hypothetically straightened out (if not in this position on the specimen) so that their

[1]Contribution No. 2542 Division of Entomology, Science Service, Department of Agriculture, Ottawa, Ontario, Canada.

[2]For a reference to the names of the setae, see Nesbitt, 1945.

length can also be expressed as a fraction of the distance between their base and that of the next seta (5 to 7, and 7 to 9). Thus the tip of seta 5 either fails to reach, approximates or passes the base of seta 7 and the same can be said of seta 7 in relation to the base of seta 9. As an example—in the description of *Caloglyphus longipilus* n. sp. (vide infra), the tip of seta 5 is said to pass the base of seta 7 for better than one-half of its own length. This means that seta 5 is greater in length by one-half than the distance between its base and that of seta 7. In the female the distances between setae 5 and 7, and 7 and 9, may be altered as the opisthosoma is free of eggs, partly filled or greatly distended. Whenever possible, the measurements are given for females in the early stags of egg laying, i. e., before the opisthosoma becomes abnormally distended.

Caloglyphus longipilus Nesbitt, new species
Figs. 3, 5, 8, and 9.

Description: The males of this species are roughly ovoid in shape with the small end directed posteriorly. Exclusive of the chelicerae they average .6 mm. in length and .3 mm. in width. The non-gravid but mature females are slightly larger, generally more globular and measure .75 by .40 mm.

The dorsum bears the usual propodosomatic escutcheon, which, in this species is weakly sclerotized and bears posteriorly a slight notch. The pseudostigmatic organ is setiform and almost equal in length to seta 4c. The nuchal bristle is readily visible and as the end is rough or very faintly pectinated, it resembles an artist's worn-out paint brush. The dorsal setae are arranged in the pattern typical of the members of this genus. For simplicity of description, the relative lengths of the setae may be expressed as fractions of one of the fixed setae. Thus the chaetotactic pattern of the male is as follows: seta 3a = 2.6 x 4c; 5= 5 x 4c; 7 = 6.5 (to 7) x 4c, or 1.5 x 5; 8 = 7; 9 = 1.1 x 7 or 60% of the length of the body; 14 = 1.2 x 7. The tip of seta No. 5 passes the base of 7 for better than one-half of its own length. The tip of 7 passes the base of 9 for slightly better than one-third of its own length. On the ventral surface seta 11 = .7 x 4c and 13 = 4 x 11 (vide fig. 9).

The chaetotactic pattern of the female may be expressed as follows: seta 3a = 2 x 4c; 5 = 3 x 4c; 7 = 5 x 4c or 1.6 x 5; 8 = 7; 9 = 7 or 30% of the length of the body; 14 = 1.1 x 7. The tip of seta No. 5 just reaches the base of No. 7. The tip of seta 7 passes the base of No. 9 for one-fifth of its length. The anal setal pattern is shown in Fig. 3.

The legs of this species are, in relation to those found on kindred forms, and in relation to the size of the body, quite long and

thin. The anterior legs in the two sexes are approximately equal in length but, because of the differences in shape and size of the body, those of the male appear and are proportionately longer equalling approximately one-half of the length of the body whereas in the female they are only about one-third. The anterior tarsi in the male are equal in length to the two preceding segments whilst in the female thy are just slightly shorter. The femora of legs I and II of both sexes bear a long seta which is equal in length to the distance between its base and the base of the macrosense seta of the tarsus. The sensory setae at the base of the tarsus I are shown in Fig. 8. The posterior legs in both sexes are equal to approximately one-half of the length of the body (in some females they are slightly shorter) and their tarsi are slightly longer than the combined length of the two preceding segments. Tarsus III of the male bears laterally one decided spine and a second structure which is more setiform than spiniform.[3] The suckers on tarsus IV of the male are located in the distal half of the segment and the proximal sucker is on much the same level as the proximal spine. Distally all the tarsi bear falcate setae. There are three such setae on each of tarsi I and II, two on tarsus III, and one on tarsus IV of the male and possibly two on tarsus IV of the female. The paddles on seta 5 of tarsi I and II and those on the terminal setae of tarsi III and IV are frequently so narrow that they can only be seen with difficulty.

The penis (vide Fig. 5) in this species is short and blunt and its tip curves ventrally. The supporting rami enclose an equilateral triangle.

Notes: The species described above resembled Oudeman's *Caloglyphus brasiliensis*[4] in many major details but differs in several small but important characteristics. When these differences coupled with the totally different types of habits, para rubber (source unknown) and rotting wheat (from Bismark, Germany) as opposed to bat guano (from Mexican caves), are taken into consideration, I believe the establishment of a new species is warranted.

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[3]In some species, e.g. *C. anomalus* Nes., this seta is definitely setiform and found in the distal feminine position; in others such as *C. berlesei* (Mich.), it is beside the fixed lateral seta and assumes the spiniform shape. The species under consideration is similar to *C. terminalis* (Banks) in that this seta is intermediate in form.

[4]As the original description of *C. brasiliensis* Oudemans (1924, Ent. Ber. 6 (140): 818) is not sufficiently detailed to be used in comparative work, I have based my knowledge of this species on 1) a study of two of Oudeman's slides labelled "*Caloglyphus brasiliensis* Oudms. 1924 ♀ dors. vent. in Sauerfutter Bismark (Sachsen) 10.10.1926 Dr. F. Zacher 3639" and ditto, "♂ dors. vent. 3639." 2) A study of Oudeman's drawings of this species, Nos. 1274-1278 inclusive. Both the slides and the drawings are now deposited in the Rijksmuseum van Natuurlijke Historie, Leiden, and it was through the kind offices of Prof. H. Boschma of the University of Leiden to whom I offer my grateful thanks, that I was able to see them.

This species may be differentiated from *brasiliensis* by the following characteristics. 1) The cleft in the propodosomatic escutcheon in the latter species extends anteriorly for almost one-half the length of the plate—in the new form it is not much more than a mild indenture. 2) In Oudemans' species, seta 9 in the female is truncate as it is in *berlesei* whereas in the new species, this seta is as long as any of the posterior setae (12 or 14). 3) In the male of *brasiliensis,* the supporting rami of the penis are heavily shouldered and the two median setae of tarsus III are spiniform; in *longipilus* the rami are without shoulders with the result that the whole genital structure resembles an equilateral triangle and tarsus III has one spiniform and one setiform seta.

The females of this species may be separated readily from those of *C. terminalis* and *C. berlesei,* the two other closely related forms, on the basis of the length of certain of the setae. In the new form, setae 5 and 7 are relatively longer than in either of the aforementioned species. In them, the tip of seta 5 misses the base of 7 for a distance approximately equal to its own length and seta 7 either misses the base of 9 for a distance equal to one-fifth of its own length or just approximates it. In the new species, on the other hand, the tip of 5 reaches as far as the base of 7 and the tip of 7 exceeds the base of 9 for a distance equal to one-fifth of its own length. Furthermore, in *C. berlesei* and frequently in *C. tarsalis,* seta 9 is short and truncate whilst in the species under discussion it is long and whip-like. Certain of the ventral setae such as the inner para-anals are shorter in this species than they are in either *C. terminalis* or *C. berlesei.* In addition to this, seta 3 of the inner row is definitely behind seta 3 of the outer row whereas in the other mentioned species, these two setae are on much the same level.

The males may be readily separated from those of *berlesei* and *tarsalis* on the shape of the penis and the relatively greater length of the dorsal setae. In both *berlesei* and *tarsalis* the penis is straight, long, and tapering whereas in the species under discussion it is short, blunt, and bent ventrally.

Type Habitat: Bat guano, Caves, Mexico.

Holotype: ♂, CUEVA DE JUXTLAHUACA, GUERRERO, January 16, 1941. (Dr. F. Bonet), No. 5764 in the Canadian National Collection, Ottawa. *Allotype:* ♀, same date. *Paratypes:* In the Canadian National Collection: 1♂, 1♀, Cueva de Jaxtlahuaca, Guerrero, 16-1-41 (F. Bonet). In the United States National Museum,

Washington: 3♂♂, 3♀♀, Gruta del Carrizae. Nuevo Leon, 16-6-42 (F. Bonet). In the Collection of Dr. F. Bonet, Mexico City, Mexico: 3♀♀, Gruta del Carrizae, Nuevo Leon, 16-6-42 (F. Bonet) (note slide also includes a ♂ of another species); 1♂ and 1♀ (2 slides) 7♀♀, Cueva de Juxtlahuaca, Guerreo, 16-1-41 (F. Bonet).

Caloglyphus paranomalus Nesbitt, new species
Fig. 2

Description: The males of this species are ovoid in shape with the small end directed anteriorly. Exclusive of the chelicerae they measure .59 mm. in length and .36 mm. in width. The mature but non-gravid females are still more globular in shape measuring .76 mm. in length by .43 mm. in width. In gravid females the opisthosoma frequently becomes so distended with eggs that the posterior margin bulges out on either side of the opening to the bursa copulatrix giving the body a characteristic shape which is reminiscent of an inverted but conventional heart.

The dorsum bears a weakly sclerotized propodosomatic escutcheon which is difficult to see; a small peg-like pseudostigmatic organ; and the usual setae which are arranged in the following chaetotactic pattern in the male; seta 3a = 1.5 x 4c; 5 = 1.5 x 4c; 7 = 5 x 4c or 4 x 5; 8 = .9 x 7; 9 = 7 or 30% of the length of the body; 14 = 7. The tip of seta 5 misses the base of 7 for a distance slightly greater than its own length. The tip of 7 just reaches the base of 9.

The chaetotactic pattern of the female may be expressed as follows: seta 3a = 1.5 x 4c; 5 = 2 x 4c; 7 = 8 x 4c or 3.5 x 5; 8 = .8 x 7; 9 = .8 x 7 or 28% of the length of the body; 14 = .9 x 7. The tip of seta 5 misses the base of 7 for a distance equal to its own length. The tip of 7 just reaches the base of 9.

The legs of this species are of moderate length for a caloglyphid. In the male they are equal to almost one-third of the length of the body; the anterior and posterior pairs are of approximately equal length with this exception that the fourth pair are about one-seventh longer than the others; and the tarsi of all are just slightly shorter than the combined length of the two preceding joints. In the female the legs bear the same relationship to each other and to the length of body; their anterior tarsi are equal in length to, and the posterior longer than, the combined length of the two preceding segments. The macrosense seta of tarsus I in both sexes is mildly clavate and equal to five-sixths of the width of the tarsus at its narrowest part; the other two sensory setae at the base of this joint are respectively slightly longer and about one-half as long as the macrosense seta. Tarsus III of the male bears only one lateral spine and three terminal setae. The suckers on tarsus IV

of the same sex are in the distal half of the segment, the proximal sucker, however, is more proximal in position than in the closely related *C. anomalus* Nesbitt.

The penis is short, truncate and heavily sclerotized. Its tip is spout-like, open on the dorsal surface and bent ventrally. The supporting rami are also heavily sclerotized.

No hypopi or heteromorphic males have been seen.

Notes: This mite was found in considerable numbers in two different samples of bat guano from Mexico. It closely resembles *C. anomalus* Nesbitt[5] in all major respects but differs from it in such details as size, the relative proportions of certain of the dorsal setae and habitat preference, e. g., in *C. anomalus* the males measure .84 to .94 mm. in length; the females .84 to .98 mm; the integument is heavy, the legs are brown and the propodosomatic escutcheon and areas about the coxae are sclerotized. In the new species, on the contrary, the body is smaller (vide supra), the integument is light, like the legs whitish in colour, and the propodosomatic escutcheon can only be seen with difficulty. The articulation areas about the coxae are not visibly sclerotized. Other differences pertain to the length of certain of the dorsal setae. In *anomalus* the tip of seta 7 misses the base of 9 for a distance almost equal to its own length and seta 9 is equal to 20% of the length of the body in both sexes. In the new species the tip of 7 just reaches the base of 9 and this latter seta is equal to 30% of the length of the body. Furthermore, the eggs in the new species are relatively larger being equal to 22% of the body length whereas in the former species, they are equal to 14% of this length.

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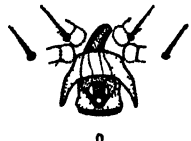
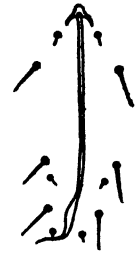
[5]*Vide* Can. Ent. 76(2) 21-24, 1944.

EXPLANATION OF FIGURES

1. Tarsus IV ♂—*Rhizoglyphus mexicanus mexicanus* Nesbitt. 2. Anue and Penis, *Caloglyphus paranomalus* Nesbitt. 3. Anus ♀, *Caloglyphus longipilus* Nesbitt. 4. Anus ♀, *Rhizoglyphus mexicanus mexicanus* Nesbitt. 5. Penis, *Caloglyphus longipilus* Nesbitt (dorsal right side, ventral left). 6. Anus ♀, *Rhizoglyphus mexicanus major* Nesbitt (bursa copulatrix and apparatus dotted in). 7. Postanal area ♂, *Rhizoglyphus mexicanus mexicanus* Nesbitt. 8. Basal setae Tarsus I, *Caloglyphus longipilus* Nesbitt. 9. Postanal area ♂, *Caloglyphus longipilus* Nesbitt.

1





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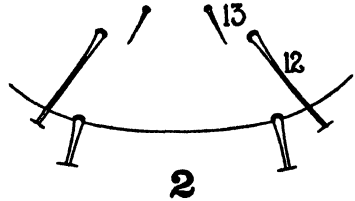

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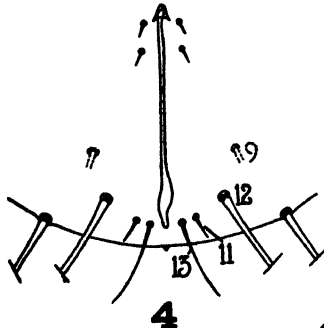

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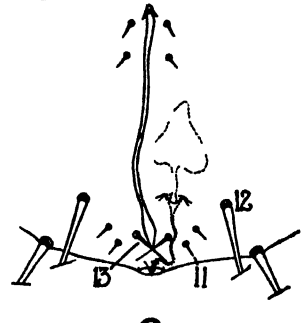

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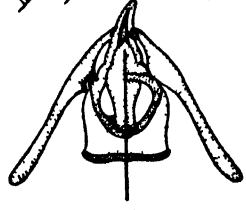

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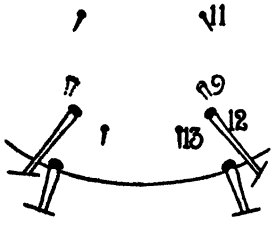

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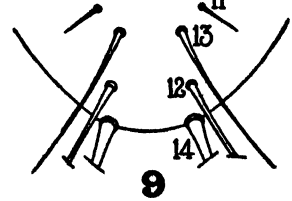

9

Such differences in themselves may not be great enough to warrant the erection of a new species but as fairly large populations of both have been found, and as there is no evidence of intergradation in the characters mentioned, I believe that we are justified in following such a course especially when the differences in habitat, rotting lillies as opposed to bat guano, are taken into consideration. A close comparison of these two species suggests that they were derived from a common ancestor which underwent a mutation resulting in the loss of the anal copulatory suckers. The break-away from the true Caloglyphid stalk must have been at a rather recent date because all the other Caloglyphid features are present and, unlike certain non-acarids (non-tyroglyphids) who have lost all trace of the copulatory suckers, or who never had them, these two forms have retained the three pairs of setae which are normally located on or behind the suckers as well as the minute pore from the centre of the sucker (vide fig. 2 which may be compared with fig. 7 or 9). To draw attention to the close relationship which evidently exists between this species and *anomalus*, it has been given the specific name *paranomalus*.

Type Habitat: Bat guano, Caves, Mexico.

Holotype: ♂, CUEVA DE LAS CALERAS. C. HIDALGO, May 7, 1941. (Dr. F. Bonet); No. 5765 in the Canadian National Collection, Ottawa. *Allotype:* ♀, same data. *Paratypes:* In the Canadian National Collection: 2♀♀ allotype slide; 1 immature ♂, Gruta de Atoyac, Atoyac, Ver. Mexico, 30-5-41, (F. Bonet); 1♂, 2 immature ♂♂, Gruta del Carrizal, Nuevo Leon, 16-7-42, (F. Bonet). In the United States National Museum, Washington: 2♂♂, 1♀, Cueva de las Caleras, C. Hidalgo, 7-5-41 (F. Bonet). In the collection of Dr. F. Bonet, Mexico City, Mexico; 2♂♂, 1 immature ♂, 3♀♀, Cueva de las Caleras, C. Hidalgo, 7-5-41 (F. Bonet); 1 immature ♂, Gruta de Atoyac, Atoyac, Ver. Mexico, 30-5-41 (F. Bonet); 1♂, 2 immature ♂♂, Gruta del Carrizal, Nuevo Leon, 16-7-42 (F. Bonet).

In addition to the types and partypes listed above the description of this species is based on some thirty other specimens, (from the same habitats) which are not listed because they are either imperfect specimens or on slides with other closely related species.

Caloglyphus armipes longisetosus Nesbitt, new subspecies

Description: Exclusive of the chelicerae, the males of this species measure from .53 to .6 mm. in length, the females .66 to .78 mm and the heteromorphic males .55 to .60 mm. The propodosomatic escutcheon, the lateral flanks of the propodosoma and the areas about the articulation of the first two pairs of coxae are weakly sclerotized. The pseudostigmatic organ is a tiny peg reminiscent of that found in *C. spinitarsus* (Herm.). The nucal bristle is bifurcate at the tip and relatively inconspicuous. The chaetotactic pattern of the dorsal setae of the male may be expressed as follows: seta 3a = 1.1 x 4c; 5 = 5.5 x 4c; 7 = 7 x 4c or 1.2 x 5; 8 = .7 x 7; 9 = 1.2 x 7 or 68% of the length of the body; 14 = 1.4 x 7. The tip of seta 5 passes the base of 7 for approximately two-thirds of its own length. The tip of 7 passes the base of 9 for almost 40% of its own length. The chaetotactic pattern of the heteromorphic male is as follows: set 3a* = 1.1 x 4c; 5 = 3.8 x 4c; 7 = 4.4 x 4c or 1.1 x 5; 8 = .7 x 7; 9 = 1.1 x 7 or 80% of the length of the body; 14 = 1.3 x 7. The tip of seta 5 passes the base of 7 for 75% of its own length. The tip of 7 passes the base of 9 for 60% of its own length.

The chaetotactic pattern of the female is as follows: seta 3a = 1.1 x 4c; 5 = 2.8 x 4c; 7 = 4.8 x 4c or 1.7 x 5; 8 = 7; 9 = 7 or 25% of the length of the body; 14 = 1.2 x 7. The tip of 5 just reaches the base of 7. The tip of 7 just reaches the base of 9. (In gravid ♀ ♀, the tip of 7 misses the base of 9 for a distance which is dependent on the number of eggs in the particular female being investigated). The anus in the ♀ is flanked by two rows of setae on each side, those of the outer row are as long as seta 4c; those of the inner row are only about one-fifth as long.

The legs of this species are relatively long. The two anterior pairs are equal to 30% of the length of the body in the ♀, 47% in the normal male and 60% in the heteromorphic male. The posterior pair are equal to 37% in the ♀, and 64% in the normal male. In the hetehomorphic male, the third leg is short whilst the fourth is equal to 77% of the length of the body. In the three forms (normal and heteromorphic, males and females) the anterior tarsi are equal in length to the two preceding joints whilst the posterior tarsi are longer than the combined length of genu and tibia.

Notes: These specimens resemble *Caloglyphus armipes* Banks very closely but differ in such details as size, the relative proportions of certain setae, and the type habitat in which they are found. Since, as was mentioned in the introduction, such differences are not as great as usually are found between well established species in this genus I am of the opinion that the new form, to which the name *longisetosus* has been given is either a feebly

*Seta 4c is a different length in the three forms. It is shortest in the ♀, longer in the normal ♂, and longest in the heteromorphic ♂. This relationship may be expressed by stating that seta 4c is 1 unit long in the ♀, 1.5 units long in the ♂, and 2.6 units long in the heteromorphic ♂.

characterized species or a subspecies of *Caloglyphus armipes*. Until more is known about this mite, I believe that we are justified in following the latter course. In time it may prove to be a geographical race of *Caloglyphus armipes*.

The representatives of this variety are 40% smaller than typical *C. armipes*. In the males the terminal portion of seta 7 extends well beyond the posterior margin of the opisthosoma whereas in the latter mentioned form, this seta just passes the margin of the body. In the female setae 5 and 7 extend respectively as far as the bases of 7 and 9. In *armipes* s. str., on the other hand, these setae miss the bases of 7 and 9 for distances almost as great as their own length. (The reader's attention is drawn to the fact that these proportions may be altered as fewer or more eggs are contained in the opisthosoma). In the latter, the macrosense, parasubbasal, and subbasal setae are all within a third to a half of being the same length; in the variety *longisetosus*, the parasubbasal seta is one-third to one-half longer than the macrosense seta and better than twice as long as the parasubbasal seta which in turn is only about three-quarters of the length of the macrosense seta. Finally, the type specimens of *C. armipes* were taken from a dead corn pyralid. Other specimens have been taken from various types of rotting organic debris and the hypopial stage has frequently been found on the adults of *Phyllophaga* species whilst the new variety, on the contrary, has only been found on bat guano.

Type Habitat: Bat guano, Cueva de las Caleras, C., Hidalgo, Michoacan, Mexico.

Holotype: ♂, CUEVA DE LAS CALERAS, C., HIDALGO, MICHOACAN, May 7, 1941. (F. Bonet); No. 5766 in the Canadian National Collection, Ottawa. *Morphotype:* Heteromorphic ♂, same data. *Allotype:* ♀, same data. *Paratypes:* 3♂♂, 3♀♀ Canadian Collection, Ottawa, same data. 1♂, 4♀♀ United States National Museum, same data. 5♂♂, 3♀♀, collection of Dr. F. Bonet, Mexico City, same data. Twelve additional specimens, not listed as paratypes for the reasons given above were used in compiling this description.

Rhizoglyphus mexicanus Nesbitt, new species
Figs. 1, 4, 7.

This species was taken from widely separated localities and is represented in the Mexican fauna by three subspecies. Morpho-

logically these are almost identical and can only be separated by such characters in the female as a) the length of the postanal setae; b) the degree of sclerotization of the propodosomatic escutcheon and the areas about the anterior coxae; c) the relative proportions of the legs; and d) the over-all size of the animal. Apart from the degree of sclerotization which is valuable, the males cannot readily be separated. In taxonomic position this mite stands close to *Rhizoglyphus columbianus* Oud. from which it differs in the nature of the psuedostigmatic organ. In the last named species this organ is a tiny peg; in the new species and its varieties, it is a very slightly pectinated setiform structure. Furthermore, the complete lack of inner propodosomatic setae (except in 2 specimens whert they are extremely minute) and especially the peculiar arrangement of the post-anal setae in the male (vide fig. 7) separate this species from all other representatives of the genus *Rhizoglyphus* known to the writer.

Rhizoglyphus mexicanus mexicanus Nesbitt, new subspecies

Disregarding the anteriorly projecting conical chelicerae the body of this mite is roughly globular in shape. The males average .455 mm. in length (the figure does not include the gnathosoma) and .304 mm in width; the females .523 by .341 (vide Table I for a comparison of the three varieties).

The propodosoma bears the usual dorsal shield which in the case of this variety is weakly sclerotized and has an undulating posterior margin. The pseudostigmatic organ is setiform and almost as long as seta 4c. The nuchal bristle is slightly bifurcate and curved in such a manner that it hooks under the gnathosoma. The dorsal chaetotactic pattern of the male is as follows: seta 3a is absent; 5 = 2.3 x 4c; 7 = 3.3 x 4c or 1.5 x 5; 8 = 1.1 x 7; 9 = 1.5 x 7 or 32% of the length of the body; 14 = 1.6 x 7. The tip of seta 5 misses the base of 7 for a distance equal to approximately one-half of its own length. The tip of 7 misses the base of 9 for a distance equal to almost one-half of its own length. On the ventral surface, seta 11 is one-half as long as 4c and seta 13 is still shorter (vide fig. 7).

The dorsal chaetotactic pattern of the ♀ may be expressed as follows: seta 3a is missing in all but two specimens where it is only .3 microns long; seta 5 = 2.1 x 4c, 7 = 3.3 x 4c or 1.6 x 5; 8 = 7; 9 = 1.4 x 7; 14 = 1.4 x 7. The tip of 5 misses the base of 7 for a distance equal to two-thirds of its own length. The tip of set 7 misses the base of 9 for a distance slightly greater than one-quarter of its own length. On the ventral surface seta 11 is very short whilst 13 is slightly longer than 4c. Only the anterior two

pairs of anal setae are visible; the posterior have disappeared completely (vide fig. 4), (i. e., no setae pits can be found).

As can be seen from Table I, the legs are of approximately the same length in the two sexes but when compared with the length of the body, those of the male are on the whole about 4% longer than the corresponding members in the female. Tarsi I, II, and IV of the female and II and III of the male are approximately equal in length to, or just shorter than the combined length of the two preceding joints. Tarsus III in the female is greater and tarsi I and IV of the male are less than this length. Tarsus I of the female is about twice as long as it is wide; in the male it is slightly less.

The penis is straight, mildly sclerotized and truncate anteriorly. It is enclosed in and supported by two rami which together with it form an equilateral triangle. The complete ring of chitin which is usually to be found in the centre of the copulatory suckers of most rhizoglyphid and caloglyphid mites is here replaced by a rosette of chitin (vide fig. 7), which is smaller but similar to that on *Rhizoglyphus columbianus* Oud. Furthermore, the usual slender seta in the antero-lateral corner of the sucker is replaced in this species by a minute spine.

Type Habitat: Leaf mould, Mexico.

Holotype: ♀, APATZINGAN, MICHOACAN, April 2, 1943, (Col. M. Cardenas et M. Correa—submitted Dr. F. Bonet); No. 5767 in the Canadian National Collection, Ottawa. *Allotype:* ♂, same data. *Paratypes:* In the Canadian National Collection; 1♂ holotype slide, 1♀ (immature) allotype slide. In the United States National Museum 3♀♀ (2 gravid) 1♂ of same data. In the collection of Dr. F. Bonet, Mexico City, Mexico. 4♀♀ (2 gravid) 1♂, same data. 1♀, Potrero Grande, Co Jan. 15, 1943, (F. Bonet).

Rhizoglyphus mexicanus major Nesbitt, new subspecies

Fig. 6.

The general description given above for *mexicanus* is applicable to this subspecies with the following exceptions. a) The subspecies *major* is about 10% larger on the average; b) the dorsal proporosomatic shield and the lateral flanks, immediately dorsad of and adjacent to the articulation areas about two anterior coxae are sufficiently sclerotized to appear brownish in cleared specimens. c) Similar sclerotized areas may be seen on the ventral surface of the body above the epimerae. In the subspecies *mexicanus* the propodosomatic shield is so mildly sclerotized that it is only yellowish in cleared specimens and the para-articulation areas of the anterior coxae and the integument above the epimerae are not

sclerotized. d) the legs of *major* are, on the average, slightly longer, more heavily built and densely pigmented. e) In *mexicanus* (vide fig. 4), seta 13 extends well beyond the end of the opisthosoma and the two posterior anal setae are missing. In *major* (vide 6), on the other hand, the tip of seta 13 just reaches the posterior margin of the opisthosoma and one of the anal setae is present.

Type Habitat: Leaf mould, Mexico.

Holotype: ♀, PAPALOAPAN, OAXACA, February 12, 1940, (Col. F. Bonet) deposited in the collection of Dr. F. Bonet, Mexico City, Mexico. *Allotype:* ♂, same data, No. 5768 in the Canadian

TABLE I - Showing the Proportions Found in the Three Subspecies of Rhizoglyphus mexicanus Nesbitt, n.sp.

	mexicanus ♂♂		mexicanus ♀♀		major ♀♀		minor ♀♀	
	Average	Low - High	Average	Low - High	Average	Low - High	Average	Low - High
Length	455	391 - 536	523	464 - 580	613	609 - 698	473	464 - 478
Width	304	261 - 362	341	290 - 377	416	406 - 478	319	290 - 362
Leg I	155	138 - 174	157	145 - 174	168	158 - 188	130	116 - 159
II	157	145 - 181	160	145 - 174	171	157 - 185	130	116 - 152
III	145	130 - 174	139	130 - 145	143	130 - 159	109	87 - 130
IV	153	145 - 188	157	138 - 181	165	160 - 190	120	101 - 153
Seta 4c	29	23 - 33	35	33 - 39	38	33 - 49	25	23 - 29
5	58	43 - 76	66	49 - 76	64	50 - 80	35	33 - 39
7	97	86 - 109	107	92 - 115	108	99 - 125	70	73 - 83
8	104	86 - 122	103	99 - 106	113	99 - 132	78	73 - 88
9	148	139 - 172	140	132 - 148	140	132 - 158	98	89 - 115
14	151	139 - 181	147	135 - 165	145	132 - 158	108	99 - 125

National Collection, Ottawa. *Paratypes:* In the Canadian National Collection; 1♀ on allotype slide; 1♀ from rotten herbs, Fortin, Ver., Mexico, Jan. 16, 1940 (Col. F. Bonet). In the United States National Museum: 1♀ from rhizomes (host plant not stated), Mexico, D. F., Mexico, July 28-30, 1939, (Col. F. Bonet). In the Collection of Dr. F. Bonet, Mexico City, Mexico. 2♀♀ holotype slide; 1♀ from rhizomes, Mexico, D. F., Mexico, July 28-30, 1939 (Col. F. Bonet).

Rhizoglyphus mexicanus minor Nesbitt, new subspecies

This subspecies is noticeably smaller than either of the above two mentioned forms; the legs are proportionately shorter, more heavily sclerotized and on most of the specimens more deeply pigmented. Its close affinity with the subspecies *major* is established

by a) the possession of the "*major*" type of post-anal chaetotactic pattern in the female, and b) the presence of sclerotized areas above the coxae and a well sclerotized propodosomatic escutcheon.

Type Habitat: Leaf mould, Mexico.

Holotype: ♀, ORIZABA, VERACRUZ, January 14, 1942. (Col. F. Bonet); deposited in the Collection of Dr. F. Bonet, Mexico City, Mexico. *Allotype:* ♂, same data No. 5769 in the Canadian National Collection, Ottawa. *Paratypes:* In the Canadian National Collection, 1 ♀ allotype slide. In the Collection of Dr. F. Bonet, Mexico City, Mexico, 1 ♀ holotype slide, 1 ♀, 2 ♂ ♂ same data (Bonet).

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IDENTIFICATION OF CERCERIS CLYPEATA DAHLBOM

The correct identification of this species was reported as being in doubt by the author in 1942 (Pan-Pacific Ent. 18:189) due to his inability to get material compared with the type at Lund, Sweden. This situation has now been clarified through the kindness of Dr. Kjell Ander of the Universitetets Zoologiska Institution who has been kind enough to compare specimens with the type. In a letter under date of Nov. 12, 1948, Dr. Ander states: "The result of my examination is that *clypeata* Dahlbom *sensu* Dahlbom is=*clypeata* Dahlbom *auct. amer.*"—H. A. SCULLEN, *Oregon State College.*

THE GENUS OXYNA IN THE NEARCTIC REGION NORTH OF MEXICO

(Diptera: Tephritidae)

BY BENSON F. QUISENBERRY

Oklahoma A. and M. College, Stillwater

The genus *Oxyna* R.-D. has not previously been recorded from the Nearctic region though evidence has shown that Marston Bates had associated with this genus one of the species included herein.[1] The recent opportunity of the writer to examine two Palaearctic species of *Oxyna*,[2] one of which was the genotype, has prompted this paper in which two previously described species and one described as new to science are assigned to this genus.

OXYNA Robineau-Desvoidy

Oxyna Robineau-Desvoidy, 1830, Mem. Acad. Sci. Inst., France 2: 755.

Generic characters—Head (Fig. 1, A): Higher than long, wider than high, width of front across median ocellus slightly wider than maximum width of eye and slightly more than half maximum head width; cheeks broad, over half maximum eye height. Frontale bare. Antennae rather short, not extending to anterior oral margin. Frons flattened or sometimes slightly elevated along median longitudinal area. Face rather long, being as long as or slightly longer than frons, with well developed antennal fovae. Oral opening large, straight on lateral margins, curved upward abruptly at anterior margin, projecting forward. Palpi very broad and long, projecting conspicuously beyond anterior oral margin. Proboscis very slender and elongate, the labella as long as or slightly shorter than maximum head length and much longer than maximum length of oral opening. One pair lower frontoorbitals; two pair upper frontoorbitals, the posterior pair weak, pale; one pair strong ocellars; one pair strong inner verticals; one pair pale, weak outer verticals which are about the length of postverticals and but little longer than the post-ocular cilia; one pair pale postverticals; postocular cilia moderately stout, pale, interspersed with fine, dark setae; genal well developed, pale.

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[1]Specimens received from the American Museum of Natural History and here described as *utahensis* n. sp. bore Bates determination label, "*Oxyna aterrima* Doane."

[2]Dr. E. M. Hering kindly presented the author with specimens of two species of *Oxyna*, *flavipennis* (Loew), and *nebulosa* (Wied.).

Thorax: Three pairs dorsocentrals, one pair anterior to transverse suture and about in a transverse line with the presuturals, the second pair well behind suture but ahead of a transverse line through supraalars, posterior pair about midway between supraalars and intraalars; one pair presuturals; one pair humerals; one pair supraalars; one pair postalars; one pair intraalars; two pairs marginal scutellars, one near apex, one near base; two pairs notopleurals, posterior pair rather weak, pale; one pair mesopleurals; one pair sternopleurals; one pair pteropleurals. Scutellum flattened above.

Legs: Fore femora with a row of long setae ventrally and scattered ones posterodorsally; middle tibiae with one strong apical spur; hind femora with one subapical, anterodorsal seta.

Wings (Fig. 1, B): Basic pattern of brown, with milky white and yellowish spots intermixed. Apex of first longitudinal vein not extending to center of wing (slightly behind), the vein setose along its entire length from humeral vein to apex. Two costal spines. Junction of veins two and three well behind apex of second basal cell and about in line with apex of anal cell; third vein bare or with a few short setae on underside near base. Lower apical angle of anal cell drawn out to a very short and inconspicuous point on sixth vein.

Abdomen: Broader and longer than thorax. Ovipositor sheath rounded dorsally more flattened ventrally, tapering to a rather broad apex. Male genitalia rather small, the ventrally directed claspers rounded, tapering towards their apex; inner process with two pair of small subapical teeth.

Genotype: *Trypeta flavipennis* Loew.

The Nearctic species that are here assigned to *Oxyna* agree very closely in structure with the genotype but disagree by having only two pairs of dorsocentrals, the presutural pair being absent (this character was also found to be present in the Palaearctic species, *nebulosa* (Weid.), and in the much longer whitish setae in the parafrontal region. In wing form *aterrima* and *utahensis* are typical of the genus, but that of *palpalis* is somewhat narrower and more flattened on anterior margin.

Key to the Species

1. Wing with two broad brown bands one of which originates at the humeral crossvein and extends broadly along the costa to slightly beyond apex of stigma where it turns posteriorly crossing over both crossveins to wing margin, the other fills the wing apex from points slightly behind apices of second and fourth longitudinal veins; scutellum very pale yellow, nearly white ..... *palpalis*

– Wing without bands as above; scutellum dark yellow or brown 2

2. Femora black except narrowly at apices.....*utahensis*
– Femora yellowish except for a dark spot or stripe on the underside of hind pair .....*aterrima*

OXYNA ATERRIMA (Doane), n. comb.

Eurosta aterrima Doane, 1899, Jour. N. Y. Ent. Soc. 7 (2): 187. Pl. 4, fig. 2.

The original description was based on a single female from Colorado and the following additional notes are also based on one specimen of the same sex taken by Dr. J. M. Aldrich in Platte Canyon (North of Idlewild), Colorado, June 10, 1927. Dr. M. T. James compared this specimen with the type and could find no significant deviation in structure or coloration, however, the comparison did reveal that the body of the type is greased thus obscuring the pollen.

The statement by Doane that the palpi and proboscis are short is misleading, they are typical of the genus though not as pronounced in comparative size as in the genotype. Third antennal segment rounded on lower anterior corner but subacute on upper one. Occiput with a black spot just above the neck that emits a short ray on either side to outer vertical bristles. Thorax with yellowish and cinereous pollen intermixed with the latter restricted mainly to the lower half of pleura, metanotum, and lower half of postnotum. Scutellum with faint brownish markings around lateral bristles. Wings (Fig. 1, C). Abdomen black in ground color but densely cinereous and brownish pollinose, the latter tending to form a pair of large spots on each tergite. Ovipositor sheath 0.53 mm. long.[3]

Type in the Collection at the State College of Washington.
Distribution: Colorado.
Host plant: Unknown.

Oxyna utahensis Quisenberry, new species

Close to *aterrima* but easily distinguished from that species by the brown marks on the mesonotum and by the black femora

Male and female—Head: Mainly whitish; frontale and vertex yellow to brownish yellow; ocellar triangle and upper half of occiput black. Some of the whitish setae on parafrontals nearly as long as lower frontoorbitals. First and second antennal segments pale yellow, former with pale setae, latter with brown; third yellow or brownish yellow, about as long as broad, apex rounded or

[3]All ovipositor sheath measurements in this study were made from the dorsal side.

the upper anterior corner subacute, variable; arista dark brown. Proboscis brownish yellow, palpi pale yellow, tips darker, with short brown setae.

Thorax: Mesonotum 0.95-1.43 mm. long. Ground color black except for humeri and upper half of postnotum which are yellowish (notopleura sometimes yellow in greasy specimens). Cinereous pollinose except for following brownish areas: large spot on mesopleura; a pair of vittae on notum that extend from anterior margin to scutellum, or to a point about midway between the two pair of dorsocentrals, or these may be obscured by grayish pollen and appear only as elongate spots at anterior dorsocentral bristle; an inconspicuous spot at base of presutural bristles, this spot sometimes emitting an inconspicuous stripe posteriorly; and scutellum. The yellowish areas and brown color of scutellum is often obscured by cinereous pollen. The short setae are whitish, and longer and more dense on pleura. Bristles black except for whitish posterior notopleural and pteropleural.

Legs: Femora black except at apices, the dark area cinereous pollinose; remainder of legs yellow. The setae mainly whitish but with some pale yellow and brownish intermixed.

Wings (Fig. 1, E): Length 2.80 mm long. Much the same as in *aterrima* except there is no small whitish spot on costa midway between humeral vein and apex of auxiliary vein, the whitish spots tend to be larger and more confluent, and there is less brown in axillary region.

Abdomen: Shining. Tergum mainly brownish pollinose but with cinereous as follows: a narrow, inconspicuous, central stripe; lateral margins; and a narrow band on hind margins of tergites, that on apical tergite may in some cases be yellowish. Venter mainly brown, cinereous pollinose, with or without yellow on hind margins of sternites, variable. The setae are whitish, and longest on hind margin of apical tergite. Male genitalia dark brown, with fine pale pubescence. Ovipositor sheath 0.59 mm. long, shining black, with very fine reddish pubescence.

Types: *Holotype* male, *allotype* female, TEMPLE FORK, LOGAN CANYON, UTAH, April 25, 1934 (T. O. Thatcher); *paratypes*, one female and two males, Blacksmith Fork Canyon, Utah, June 4, 1935 (T. Thatcher), one male, Green Canyon, Utah, June 1, 1935 (G. F. Knowlton), one male, Logan Canyon, Utah, May 29, 1933 (G. F. Knowlton and E. W. Anthon) and one male, same date, but May 16, 1934 (T. O. Thatcher), in the American Museum of Natural History. Paratypes, two males, Lind, Washington, May 15, 1922 (M. C. Lane), in the United States National Museum.

Host plant: Unknown.

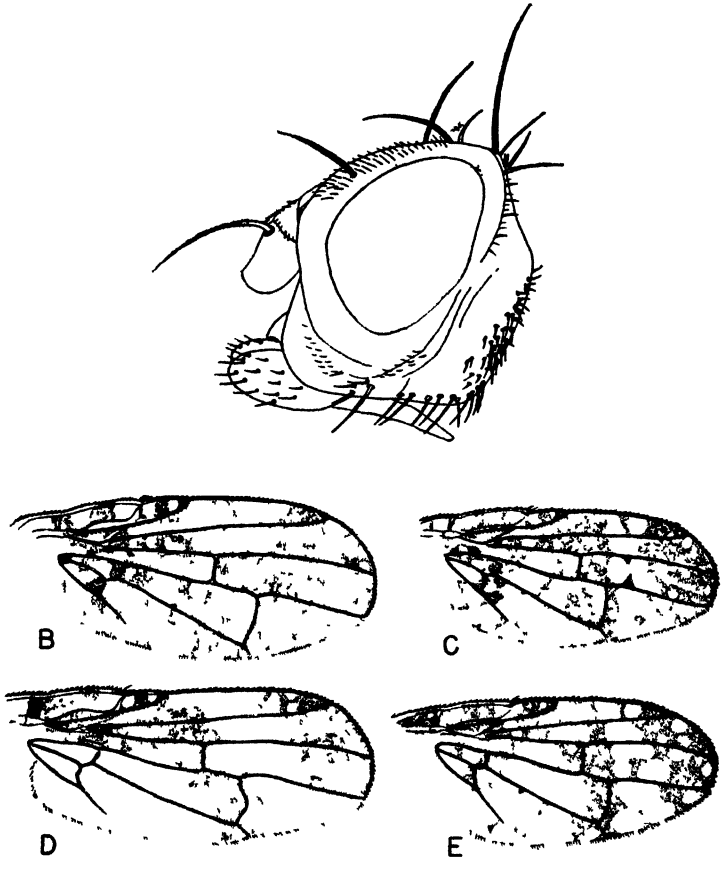

Fig. 1—A. Head of *O. flavipennis* (Loew), lateral view; B. wing of *O. flavipennis* (Loew); C. wing of *O. aterrima* (Doane); D. wing of *O. palpalis* (Coquillett); E. wing of *O. utahensis* Quisenberry.

OXYNA PALPALIS (Coquillett), n. comb.

Tephritis palpalis Coquillett, 1904, Invertebrata Pacifica. 1:30.

This species is easily distinguished from *aterrima* or *utahensis* by the distinctive wing pattern. The following additional notes include characters of the female which had not previously been described, the original description of the species being based on a single male specimen from Ormsby County, Nevada.

There are two or three pair of weak, whitish setae along the parafrontal area which are nearly the length of the lower fronto-orbitals. Thorax grayish pollinose except for some brownish on notum. Humeri, sometimes the area immediately below to anterior coxae, and sometimes the notopleural area, and wing base yellowish. Pteropleural and posterior notopleural bristles whitish. Scutellum wholly pale yellow, nearly white. Wings (Fig. 1, D) 2.80-4.20 mm. long; the yellowish spots in the stigma may be only faintly discernable; the apical brown band may extend rather far back on anterior costal margin so as to nearly touch the basal band. Dorsum of abdomen with some light brownish pollen intermixed with the cinereous; venter yellow, with cinereous and yellowish pollen, the former sometimes obscuring yellowish color; pleura yellowish. Ovipositor sheath 0.59-0.84 mm. long, pale amber or yellowish brown in color, bare except for some very fine scattered hairs. Grayish pollen sometimes obscures the pale yellowish color of male genitalia.

Type in the United States National Museum.

Distribution: Nevada, California and Idaho.

Host plant: Unknown.

Material examined included two females and one male, no data, from the American Museum of Natural History; one male, Yellowstone (Roosevelt Lodge), California, July 1, 1938 (E. C. Van Dyke), from the California Acadaemy of Sciences; one female, June 4, 1927, Hollister, Idaho, and one male labeled, "Ormsby County, Nevada, July 6 (Baker), cotype." The Nevada male was received in a shipment of tephritids from the Stanford University collection.

Dr. Alan Stone checked the type for the author and reports that it bears the same information as regards the date and collector as was found on the label of the previous mentioned Nevada specimen, the other information being as originally given by Coquillett. The "cotype" designation is treated as a probable error in labeling since Coquillett mentions only one specimen in the original description.

THE GENUS ERYTHMELUS IN CALIFORNIA
(Hymenoptera, Mymaridae)

BY RICHARD L. DOUTT
Division of Biological Control, University of California
Albany, California

This paper is a synopsis of the species of *Erythmelus* presently known to occur in California. The author is grateful to A. B. Gahan who kindly compared series of specimens from California with the type material held in the United States National Museum.

Erythmelus flandersi Doutt, new species

Near *picinus*, but easily distinguished by having funicle segment four shorter than segment six. Differs from *gracilipes* by possessing longer funicle segments, more extensive discal ciliation on forewing, and a decidedly darker color. Antennae somewhat similar to *longicornis*, but *flandersi* has longer forewings and relatively longer basal segments of hind tarsi.

Female. Length 0.9-1.0 mm. General body-color very dark brown to black. Basal and ventral portions of abdomen lighter. Trochanters pallid. Eyes red. Wings hyaline or but slightly and indistinctly fumated.

Viewed laterally, head over twice longer than wide; face between eyes concave; fronto-vertex peaked at acute angle. Viewed frontally head as wide as long; ridge of fronto-vertex transverse between posterior ocelli; orbital lin broken in fronto-vertex area, of beaded appearance; facial line transverse, unbroken.

Antenna as in Fig. 1, A. Funicle segment 1 slightly longer than 2. Segments 2-6 gradually increase in width. Segment 4 longer than any funicle segment except 6, the largest. Club thickly clothed with small sensory setae.

Forewings long and somewhat narrow for genus. About 5 lines of discal cilia on apical third of wing. A single irregular line of short discal setae extends medianly from beneath wing venation to apical ciliation of disk. Single row of setae located near cephalic margin of wing, extending from venation to apex. Wing base normally fumated.

Posterior wings with single complete median row of cilia. Sparse row near cephalic margin, another partial row near basal caudal margin. Maculate.

Thorax long; in cleared specimens a light transverse band appears on scutum. Scutellum longitudinally striate. Apex of metanotum acutely projects dorsally.

Abdomen with prominent ventral sheath beneath ovipositor. Ovipositor and lateral valves slightly exerted.

Male. Length 1.0 mm. color as in female. Genitalia extended beyond apex of abdomen, (all specimens examined had been processed through alcohol for slide mounts). Antennae as in Fig. 1, F., filiform, each funicle segment longer than either scape or pedicel. Funicle segments with longitudinal carinae, setae arise from between carinae. Wings slightly narrower than female.

Described from 17♀ ♀ and 4♂ ♂ all captured by R C. Dickson on yellow tanglefoot boards suspended in orange trees. *Holotype,* ♀, COVINA, CALIFORNIA, May 3 to 17, 1946. *Allotype,* ♂ COVINA, CALIFORNIA, May 3 to 17, 1946. *Paratypes,* 9♀ ♀, 1♂, COVINA, CALIFORNIA, May 3 to 17, 1946; 4♀ ♀, 2♂ ♂, April 26, 1946; 1♀, PERALTA, CALIFORNIA, May 3 to 17, 1946; 1♀, E. HIGHLAND, May 1, 1946; 1♀, CUCAMONGA, CALIFORNIA, May 1, 1946.

Host unknown.

Types deposited in the collection of the Division of Biological Control of the University of California. Paratypes to be deposited with the California Academy of Sciences and the United States National Museum.

This species is dedicated to S. E. Flanders, through whose energy the first representative collection of Californian Mymaridae was assembled.

ERYTHMELUS GRACILIS (Howard)

Anaphes gracilis Howard, 1881, Rept. Ent. U.S.D.A. 1880, p. 370.
Anaphes cinctiventris Girault 1911, Trans. Amer. Ent. Soc., 37(3): 286-287. (New synonymy).

The type locality of *cinctiventris* is Mountain View, California, however, this species is believed to be synonymous with *gracilis* which has been taken in Georgia, Illinois, and District of Columbia. All the specimens examined were collected by R. C. Dickson on tanglefoot boards suspendsd in orange trees. The following localities are recorded: West Arcadia, 2♀ ♀, June 14, 1946; 3♀ ♀, August 25, 1946. Cucamonga, single females captured July 1, July 26, August 9, 1946. Covina, Calif., 1♀, August 25, 1946. East Highland 1♀, Sept. 20, 1946.

Hosts for *A. gracilis* are recorded as *Aspidiotus perniciosus* Comst., *Lepidosaphes ulmi* (Linn.), and the eggs of *Carpocapsa pomonella* (Linn.). The unusual host range indicated by these

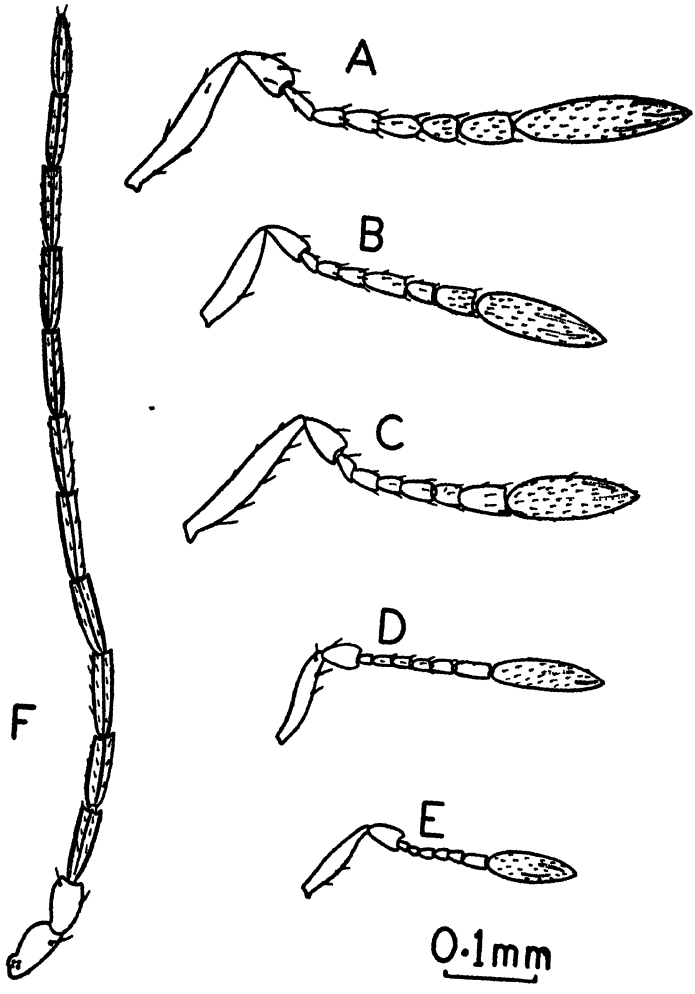

Figure 1. Antennae of Californian Species of *Erythmelus*. A. *flandersi* ♀, B. *picinus* ♀, C. *gracilis* ♀, D. *miridiphagus* ♀, E. *psalladis* ♀, F. *flandersi* ♂.

records suggests the need for confirmation through controlled rearings.

ERYTHMELUS MIRIDIPHAGUS Dozier

E. miridiphagus Dozier 1937. Jour. Agric. Univ. Puerto Rico, 21: 133.

E. miridiphagus has recently been collected along riparian areas in northern California. Otherwise this species is known only from Puerto Rico. The number of entomologists who have collected Mymaridae is small indeed, and the inadequate coverage of vast areas accounts for such spotty distributional records.

E. miridiphagus has been collected in California at the following localities: Russian River, near Forestville, 2♀♀, May 28, 1947 (Doutt); Rio Nido, 2♀♀, May, 1, 1947 (Doutt); Nicolaus, 1♀, 1♂, April 25, 1947 (Doutt).

The host of *E. miridiphagus* in Puerto Rico is asumed to be a mirid, *Polymerus cuneatus* Distant, but no actual rearings verify this supposition.

ERYTHMELUS PICINUS (Girault)

Anaphes picinus Girault, 1916. Ent. News, 27:6-7.

E. picinus was described from New Mexico and these records extend its range to California. Specimens have been collected in the following localities: Hecker Pass, 1♀, Sept. 17, 1947 (Doutt); La Manda Park, 2♀♀, April 12, 1923 (Compere); Novato, 1♀, July 3, 1947 (Doutt); Rio Nido, 1♂, May 28, 1947, 1♀, Oct. 17, 1947 (Doutt), Forestville, 2♀♀, May 28, 1947.

ERYTHMELUS PSALLIDIS Gahan

Erythmelus psallidis Gahan, 1937 Proc. Ent. Soc. Wash., 39(9): 266-269.

The species is distributed through South Carolina, Mississippi, Louisiana, Arkansas, Texas, and Arizona. The record in this paper extends its range to southern California. During 1933, in August and September, 12♀♀ and 5♂♂ specimens were collected from ragweed at Arlington, Calif., by S. E. Flanders.

E. psallidis is probably the only species of the genus with a host record that can at this time be considered entirely reliable. Its preferred host is the cotton flea hopper, *Psallus seriatus* (Reuter), but it also attacks a mirid, *Reuteroscapus sulphureus* (Reut.), as

determined through careful rearings by Ewing and Crawford (1939). On purely circumstantial evidence they also list as a host another mirid, *Macrolophus separatus* (Uhler).

ERYTHMELUS IO (Girault)

Anagrus io Girault, 1911 Trans. Amer. Ent. Soc., 37(3):294-295.

Girault described this species from a single male taken in Illinois and he appended the description with a statement that a similar tag mounted male was found in the National Museum collection with a locality label of Los Angeles County California. However, this specimen differed from the type, *io*, in wing coloration. Girault later suggests that *io* is similar to *cinctiventris* and cannot be defined very well.

It is possible that *io* is a valid species and is present in California, but none of the specimens which have been examined are recognizable as this species. It is also possible that the female of *io* is described as an entirely different species. The status of *io* is considered too doubtful to warrant its inclusion in the following key.

KEY TO CALIFORNIAN SPECIES OF ERYTHMELUS

Females

1. Funicle segment 4 shorter than segment 6 2
– Funicle segment 4 equal to or longer than segment 6 ..... *picinus*
2. Species small, funicle segment 1 small, less than half length of funicle 6 3
– Species large, funicle segment 1 over half length of 6 ..... *flandersi*
3. Basitarsus only slightly longer than second tarsal segment 4
– Basitarsus nearly twice the length of second tarsal segment ..... *gracilis*
4. Funicle segment 5 subquadrate, Californian specimens of light color. Club about 3 times as long as broad ..... *psallidis*
– Funicle segment 5 not subquadrate, Funicle 6 almost twice length of any other funicle segment. Club 3.5 times as long as broad ..... *miridiphagus*

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RECORD OF A FUNGUS OUTBREAK AMONG ADULT BEES OF THE GENUS ANDRENA

(Hymenoptera, Andrenidae)

BY GEORGE E. BOHART[1]

U. S. Legume Seed Research Laboratory, Logan, Utah

On May 19, 1934, near Trinity Center, Trinity County, California, various wild bees were observed collecting pollen from a dense stand of the buttercup, *Ranunculus californicus* Benth. It was the densest population of bees on flowers that I have ever observed, each flower seeming to have one or more visitors. A few sweeps of the net often collected fifty or more specimens. *Andrena complexa* Viereck was the dominant bee, but a species of *Panurginus* was also quite abundant. A *Nomada*, presumably parasitic on the *Andrena*, was likewise common.

Subsequently for a few days the weather was cool and showery, but cleared by May 23 to the extent that bees reappeared in their former abundance. A few *A. complexa* bees were seen to be dead and still clinging in life-like position to flowers and stems of the buttercup. Resemblance of these bees to syrphid flies killed on plants and to house flies killed on walls by the entomophagous fungus *Empusa* was at once apparent. The clinging posture and swollen abdomens showing white beneath the intersegmental membranes were unmistakable. Within two days living bees were rare, but on every *Ranunculus* plant there were several to many bees that had been killed by the fungus. Remarkably, the other species of bees appeared to be immune. Syrphid and emidid flies, the latter often seen feeding upon various small bees, were likewise unaffected.

I am unaware of previous reports of fungus epidemics in the field among adult bees. At the time of observation, however, I did not realize that the situation was unusual and made only the superficial observations given above. It would be interesting to know whether others have observed similar outbreaks among bees.

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[1]Bureau of Entomology and Plant Quarantine, Agr. Res. Admin., U. S. D. A.

NOTES ON A LITTLE KNOWN WORK BY PH. F. GMELIN PUBLISHED IN 1758 WHEREIN HE DESCRIBES SOME NEW SPECIES OF APHIS

BY F. C. HOTTES
Grand Junction, Colorado

In *Fauna Suecica* published in 1746 Linnaeus named and described seventeen species belonging the the genus *Aphis*. Of the seventeen species treated in this work all but three were named as binomials. Because this edition of Fauna Suecica was published before 1758 the names and species described in this work would have no validity in our present system of nomenclature had not Linnaeus made some of them valid by reuse in the tenth edition of his *Systema Naturae*. The species thus treated were: *Aphis ribis, Aphis ulmi, Aphis pistinacae, Aphis sambuci, Aphis rumicis, Aphis rosae, Aphis tiliae, Aphis betulae,* and *Aphis pini.* In this edition of the Systema Naturae four species listed in Fauna Suecica were assigned new names. Thus *Aphis cucubali* became *Aphis lychnidis, Aphis serratulae* became *Aphis cirsii, Aphis artemisiae* became *Aphis absinthi,* and *Aphis centaureae* became *Aphis jaceae.* The trinomial which in this edition of *Fauna Suecica* was described on page 387 in the appendix and given the name *Aphis populi nigrae,* became *Aphis bursaria* in the tenth edition of the *Systema Naturae,* and for some reason *Aphis aceris* and *Aphis plantarum aquaticarum* were not treated but were left by Linnaeus to be described in the second edition of *Fauna Suecica* which was published in 1761. *Aphis aceris* being given the same name and *Aphis plantarum aquaticarum* becoming *Aphis nymphae.*

Joh. Aug. Ephraim Goeze in his *Entomologische Beyträge zu des Ritter Linné Zwölften Ausgabe des Natursystems,* Band II, published in 1778 frequently gives as reference, *Onomat. hist. nat. P. I.* in connection with the species belonging to the genus *Aphis* which he treats. This reference unique in aphid literature, so far as I am aware, aroused my interest.

After failing to locate this work in this country in 1932 I wrote to the late Dr. Walter Horn then Direktor of the Deutsches Entomologisches Institut der Kaiser Wilhelm Gesellschaft. I asked him to try and locate the work for me, and if successful to send me photostats of the pages on which the genus *Aphis* was treated.

Dr. Horn answered almost at once, saying that he had never seen a copy of the work but that he would try to locate one in Germany. He was able to give me the following citation: Ph. F. Gmelin, *Onomatologia medica completa seu onomatologia historiae naturalis oder vollstandiges Lexicon das alle Benennungen der Kunstworter der Naturgeschichte nach ihrem ganzen Umfang erklärt. Ulm,* 1758-1777, 7 vols. (vols. 5-7 are by G. F. Christmann). This work is not listed by Hagen in his *Bibliotheca entomologica.* It is listed by Horn and Schenkling in their *Index Litteraturae Entomologicae* but they make no mention of Christmann. The British Museum catalogue of printed books lists Christmann as the author of vols. 5-7 of this work. Recently I have located a copy of this work by Gmelin in the Army Medical Library, Cleveland Branch (there is also a copy in the library of the British Museum) but I have seen only photostats of the title page of vol. 1 and of the columns devoted to *Aphis.* These were kindly sent me by Dr. Horn, a number of years ago.

For practical reasons the tenth edition of the Systema Naturae is assumed to have been published on January 1, 1758. Thus we must assume that Gmelin published his work after that of Linnaeus. There is ample evidence, however, that Gmelin was not familiar with the tenth edition and that Linnaeus was not familiar with the work of Gmelin. As proof one might cite the use of such terms as *artemisiae, serratulae,* and *centaurae* for species by Gmelin which had been used for species by Linnaeus in *Fauna Suecica* but which were not used by him for species in the tenth edition. One might also offer as proof that Gmelin was not familiar with the tenth edition, the species described as new in this work by Linnaeus of which Gmelin makes no mention. Of the works of Linnaeus which I have seen, no mention is made of Ph. F. Gmelin, or his species, the names of which were quite obviously taken from the edition of *Fauna Suecica* published in 1746.

Of the twenty names which Gmelin associates with the name Aphis, only *populi nigrae, ribis, sambuci,* and *tiliae* are associated with the name of Linnaeus. If Gmelin's borrowed names which he associated with quite adequate descriptions may be credited to him, and apparently they may according to the rules of Zoological Nemenclature the species treated by him may be considered as follows:

Aphis aceris Gmelin 1758, first valid use as a binomial. *Aphis aceris* L. 1761 is a homonym.

Aphis aceris as described by Linnaeus is generally considered to have been a composite species and there is no reason for thinking that the species described by Gmelin was otherwise.

Periphyllus aceris L. and *Periphyllus testudinatus* Thornton following Kessler Van Der Goot and Theobald would appear to be very difficult to separate except on the characters offered by their dimorphic forms. *P. testudinatus* having marked foliate lateral plates in the dimorph which are lacking in the dimorph of *P. aceris* but replaced in part by long dark hairs. Perhaps it will be less confusing to consider *Periphillus aceris* Gmelin to be the same species that in the restricted sense has been considered *Periphyllus aceris* (L.).

Aphis artemesiae Gmelin, 1758, first valid use as a binomial but a synonym of *A. absinthi* L.

Aphis betulae Gmelin 1758, *Aphis brassicae* Gmelin 1758, *Aphis cardui* Gmelin 1758 are homonyms of species described by Linnaeus in the tenth edition of the Systema Naturae. Both Linnaeus and Gmelin describe *A. betulae* as without wings and appendages. Linnaeus did not describe *A. brassicae* in the first edition of Fauna Suecica but in the 10th edition of Systema Naturae. The fact that Gmelin made use of the name *brassicae* can be taken as an indication that he was familiar with the 10th edition.

Aphis centuareae Gmelin 1758, first valid use as a binomial but a synonym of *Aphis jaceae* L.

Aphis centureae Koch is a homonym and will require a new name.

Aphis cucubali Gmelin 1758, first valid use as a binomial but a synonym of *Aphis lychnidis* L.

Aphis cucubali Passerini is a homonym and will require a new name.

Aphis nymphae Gmelin 1758, first valid use as a binomial. *Aphis nymphae* L. 1761 is a homonym as well as a synonym.

Aphis pistacinacae Gmelin is a synonym of *A. pistacinaceae* L.

Aphis pistaciae Gmelin 1758, first valid use as a binomial. The species is a synonym of *Aphis bursarus* L. *Aphis pistaciae* L. 1767 is a homonym of the species described by Gmelin. Schumacher 1921 considers *Pemphigus utricularius* Passerini to be a synonym of *A. pistaciae* L. Schumacher places *Aphis pistaciae* L. in the genus *Baizongia* Rondani, following Rondani who had made it the type of his genus. Schumacher also makes the genus *Pemphigella* Tullgren a synonym of *Baizongia*. If Schumacher is correct

in his species synonymy *P. utricularius* Pass. appears to be the first available name to replace that proposed by Linnaeus. However, I choose to follow Mordvilko 1935 who considers *utricularius* Pass. to belong to the genus *Geoica*. This being the case it is most unlikely that the species described by Passerini is a synonym of the species described by Linnaeus. In this paper Mordvilko considers *Baizongia* and *Pemphigella* as synonymous but he gives preference to and uses *Pemphigella*. It is also in this paper that Mordvilko places *Tychea setariae* Pass. *Endeis carnosa* Buckton and *Geoica squamosa* Hart as synonyms of *Geoica utricularia* (Pass.). This synonymy had in part been indicated by Horvath (*Tychea setariae* Pass. and *Geoica squamosa* Hart) as early as 1896. If one follows Mordvilko there appears to be no species which has been declared a synonym of *A. pistaciae* L. Therefore, a new name is necessary. To honor the memory of one of my former Professors and the Nestor of American Aphidologists, I propose the name Baizongia oestlundi *nom. nov.* to replace that of *Baizongia pistaciae* (L.)

Aphis ribis credited to Linnaeus.

Aphis rosae Gmelin 1758 and *Aphis rumicis* Gmelin 1758 are homonyms as well as synonyms of species described by Linnaeus.

Aphis sambuci credited to Linnaeus.

Aphis serratula Gmelin 1758 first valid use of the term as a binomial but the species is a synonym of *Aphis cirsii* L. *Aphis serratula* Schrank is a homonym and will require a new name. *Aphis serratulae* Kaltenbach is also a homonym of the species described by Gmelin. Lambers has biven the name *Dactynotus marcatus* to the species described by Kaltenbach. Dr. Lambers thought of Kaltenbach's species as a homonym of the species described by Schrank.

Aphis tiliae credited to Linnaeus.

Aphis ulmi Gmelin 1758 is a homonym as well as a synonym of the species described by Linnaeus.

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A NEW SUBSPECIES OF PTEROMBRUS RUFIVENTRIS (CRESSON)

(Hymenoptera, Tiphiidae)

BY KARL V. KROMBEIN

Bureau of Entomology and Plant Quarantine
Agriculture Research Administration
U. S. Department of Agriculture

In 1938 (Trans. Amer. Ent. Soc. 64: 236-8) I considered that *Pterombrus rufiventris* (Cresson, 1872. Trans. Amer. Ent. Soc. 4: 201; described as *Myzine*) was not divisible into discrete subspecies. Additional specimens have been available recently, and I have now concluded that this species will have to be divided into two subspecies. Males from western Texas, Arizona, and California have much paler wings and are slightly smaller (10 mm. avg. length) than males from eastern Texas, Louisiana, North Carolina, and Virginia which have the wings strongly infumated with brown and are slightly larger (12 mm. avg. yength). Females of the eastern form have dusky wings, while those of the western form have pale wings except the apical third of the forewing and a cloud along the basal vein darker.

The type of *rufiventris* (Cresson) is a male of the dark-winged eastern form. It was collected in Dallas Co., Texas. The Virginia, North Carolina, Louisiana, and Texas (Lufkin) specimens recorded by me in 1938 all belong to *rufiventris rufiventris.*

The western race, which I designate here as *Pterombrus rufiventris hyalinatus* Krombein, new subspecies, agrees in details of sculpture with the typical subspecies, but is readily distinguished by the paler wings, and the generally smaller size of the male. I have seen only one female of each subspecies; that of the typical subspecies is 13.0 mm. long, and that of *rufiventris hyalinatus* is 14.8 mm. long.

Type: ♂; PRESIDIO, TEXAS; June 25, 1945; (P. A. Glick; on cotton). [U. S. National Museum, Type No. 58970.] The type is 10.7 mm. long.

Allotype: ♀; Palo Verde, Imperial Co., California; August 31, 1946; (P. D. Hurd). [California Insect Survey].

Paratypes: 1 ♂; same data as type. 1 ♂; El Paso Valley, Texas;

July 31, 1947; (L. W. Noble; on alfalfa). [Both U. S. N. M.] 1 ♂; Arizona; [A. N. S. P.]. 1 ♂; Blythe, California; July 30, 1947; (Ray F. Smith; on alfalfa); [California Insect Survey]. 1 ♂; Experiment Farm, Imperial Co., California; June 1, 1912; (J. C. Bridwell; visiting glandular hairs on leaves of *Helianthus annuus*); [K. V. K.]. Paratypes vary in length from 9 to 11 mm.

Specimens from Chilpancingo, Guerrero, Mexico, and Baja California, recorded respectively by Cameron, 1894 (Biol. Centr.-Amer., Hym. 2: 258, pl. 12, fig. 23), and Fox, 1895 (Proc. Calif. Acad. Sci. (2) 5: 263, pl. 21, figs. 1-5), are probably referable to *rufiventris hyalinatus*.

A METHOD FOR COLLECTING MALE STYLOPS
(Coleoptera, Stylopidae)

BY J. W. MAC SWAIN
University of California, Berkeley

Males of the Stylopidae are generally uncommon in insect collections, more particularly those genera which are parasitic on solitary nesting Hymenoptera. For this reason, results obtained from using females of *Stylops pacifica* Bohart to attract large numbers of males may be of interest.

S. pacifica is a relatively common parasite of *Andrena complexa* Viereck and *A. suavis* Timberlake. These two bees, which occur throughout Northern California and Oregon from sea level to about 7000 feet, are apparently limited in their pollen collecting habits to the flowers of *Ranunculus*. At lower elevations emergence of the bees varies from the middle of February to the middle of March depending on the season. Almost one hundred percent of the first individuals to appear in any one locality are parasitized by *S. pacifica*. The parasites are very conspicuous, since they protrude from between the posterior abdominal tergites of their host. The female has her flat, brown, triangular cephalothorax exposed while the male is recognizable by its larger, darker, oval puparium. On the first warm day after the appearance of the bees the male Stylops emerge from their puparia. These males are capable of immediate flight and have been observed to live only a few hours. However, males may be enocuntered in the field over a period of a week to ten days.

The ability of female insects to attract males hasbeen used by collectors with varying degrees of success in many groups, but its use for the capture of male Stylops has not been reported. In the spring of 1947 a study of the mating behavior of *S. pacifica* was undertaken. For this study a number of bees containing the female parasite were placed on flowers and on several occasions males appeared within a few minutes. In 1948 emergence of the bees was first noted on February 16 when 7 male Stylops were collected in one hour by placing bees containing female parasites on the flowers. The following day, which was somewhat overcast, the same method gave negative results. On the next clear day, February 20, 193 males were taken by two collectors in two and one half hours. Of this number 111 were captured by one collector using a single *Andrena complexa* which contained a female parasite. After three days of inclement weather collecting was resumed with the stylopized bees confined in small cages. The cages consisted of a three inch tube of cloth with a cork stopper inserted in each end. In this experiment each parasitized bee was immobilized by lightly crushing its thorax. The bee was then pinned through the thorax and the pin inserted into the smaller end of the cork within the cage. Three such cages were set out at intervals of about two hundred feet and visited regularly over a period of two hours. During this time 263 males were collected either on or flying about cages. In this experiment it was found that the cages were very effective when set out on barren ground away from surrounding flowers.

The greatest difficulty in this technique is the problem of obtaining female parasites which will attract the males. Of the total of 152 female Stylops collected in 1948 only 8 were found to be attractive to males at the time of capture. However, the bees which were captured earliest in the morning contained the greatest percentage of females which could be used for trapping. At the time that the 152 female Stylops were taken, bees containing the empty puparia of 269 male Stylops were collected. In contrast to the number of empty puparia observed, a total of 510 males of *S. pacifica* were attracted by the use of the 8 females.

R. M. Bohart in his 1941 revision of the Strepsiptera reports known males for about half of the North American species of the genus *Stylops*. If it is found that this trapping method can be applied to other members of this genus the number of species from which males are known may be increased.

NOTES ON THE OCCURRENCE OF AGROMYZID FLIES DURING 1948, AND A RECORD OF TWO UNREPORTED SPECIES IN CALIFORNIA

W. HARRY LANGE, JR.
University of California, Davis

During the summer and fall of 1948 in different sections of California, several species of leaf-mining flies of the family Agromyzidae were exceedingly abundant and caused serious damage to truck and field crops. They also selected a wide range of plants of little economic importance. In the past the commonest species causing damage to various truck and field crops has been reported as the serpentine leaf miner, *Agromyza* (or *Liriomyza*) *pusilla* Meigen. It is now apparent that several species are involved. In the Sacramento and San Joaquin valleys of California where it is hot and dry during the summer, the common species causing damage to alfalfa, beans, melons, and tomatoes is a small species with a yellow scutellum, *Agromyza* (*Liriomyza*) *subpusilla* Frost (orig. desc., Jour. New York Ent. Soc. 51: 255-56, 1943) which has been previously unreported in the state. The specimens were determined by Dr. S. W. Frost and Dr. C. W. Sabrosky. This miner also selects a number of plants of little economic importance. Along the coast of California, in the coastal valleys, and in areas having a coastal influence, this species is replaced by a larger species, also with a yellow scutellum, which is close to the European *Agromyza* (*Liriomyza*) *flaveola* Fallen (also has been called *A. orbona* Meigen). During 1948, this species damaged cruciferous crops, lettuce, melons, peas, sugar beets, tomatoes, and cultivated flowers, and, in addition, selected many hosts of no economic importance. Through the courtesy of Dr. R. N. Jefferson, I was able to examine flies from southern California damaging tomato and found them to be close to or equal to *Agromyza* (*Liriomyza*) *pusilla* Meigen. This would indicate that we have three species in California with a yellow scutellum which cause damage to a wide range of plants.

The corn blotch miner, *Agromyza parvicornis* Loew, is a widely distributed fly, but no definite records in the literature could be found for the occurrence of this insect in California. During

August, 1948, it was found damaging young corn at Davis, Yolo County. The characteristic blotch mines caused some drying up of the tips of the leaves, and the damage was accentuated by the persistent, white, feeding punctures of the females. The fly was determined by Dr. C. W. Sabrosky.

NOTES ON SOME FOREST INSECTS OF BAJA CALIFORNIA

By F. P. Keen

U. S. D. A., Agr. Res. Admin., Bureau of Entomology and Plant Quarantine

In the Northern District of Baja California, Mexico, about 80 miles below the United States border lies the mountain range of San Pedro Martir, rising to an elevation of over 10,000 feet and carrying extensive forests of pine, fir, cedar and oak. These forests are separated from similar forests of the Sierra Madre in southern California by approximately 100 miles of open, non-timbered, brush-covered hills, with only a few intervening patches of Jeffrey pine, Parry piñon and oak.

For many years it has been of interest to know whether or not the trees on this botanical island were infested with the same species of insects found associated with their counterparts north of the border. In late October and early November of 1947, an opportunity to collect forest insects from this region was afforded the writer, who accompanied J. W. Duffield and Wm. C. Cummings, of the Institute of Forest Genetics, on an expedition to collect specimens of seeds, cones, leaves and insects from the trees on this mountain range.

Tree species found on San Pedro Martir included Jeffrey pine (*Pinus jeffreyi*), sugar pine (*Pinus lambertiana*), lodgepole pine (*Pinus contorta*), *Parry piñon* (*Pinus parryana*), white fir (*Abies concolor*), and incense cedar (*Libocedrus decurrens*). Nearer the coast on the bluffs of San Vicente canyon, near the village of

San Isidro, Bishop pine (*Pinus muricata*) was found, and in the mountains east of Ensenada collections were made from knobcone pine (*Pinus attenuata*).

The distance traveled by horseback to reach San Pedro Martir and the lack of feed for stock made it impossible to spend more than one day on the mountain. Hence, it was impossible to make comprehensive collections from all tree species. Sufficient collecting was done, however, to establish the fact that the native trees on this isolated mountain had associated with them the same insects as found associated with these tree species in California to the north. Isolation had proved no barrier.

Species collected, all of which apparently are new records for Baja California, were as follows:

Pinus jeffreyi

Dendroctonus jeffreyi Hopk.[1] (New attacks under bark).
Dendroctonus valens Lec.[1] (Attacking base of trees).
Ips emarginatus (Lec.)[1] (Under bark).
Melanophila californica Van. D (Larvae only, under bark).
Hylurgops subcostulatus (Mann.)[1] (Under bark).
Orthotomicus ornatus Sw.[1] (Under bark).
Gnathotrichus retusus (Lec.)[1] (In sapwood).
Plegaderus nitidus Horn.[2] (Under bark).
Glischrochilus sp. (apparently undescribed)[3].
Xantholinus sp.[5].

Pinus lambertiana

Dendroctonus monticolae Hopk.[1] (Under bark of windfall).

Pinus muricata

Carphoborus sp.[1] (Attacking bark of trunk and limbs).
Eucrossus villicornis Lec.[4] (Reared from wood).

Abies concolor

Scolytus ventralis Lec. (Work noted on bark and sapwood).
Xylotrechus abietis Van D.[4] (Reared from wood of trunk).

Quercus agrifolia

Pseudopityophthorus sp. prob. *pubipennis* (Lec.[1]) (Under bark).

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[1]Identifications checked by W. H. Anderson, U. S. Bureau of Entomology and Plant Quarantine.
[2]Identified by H. S. Barber, U. S. Bureau of Entomology and Plant Quarantine.
[3]Identified by E. A. Chapin, U. S. National Museum.
[4]Identified by E. Gorton Linsley, University of California.
[5]Identified by R. E. Blackwelder, U. S. National Museum.

OCCURRENCES OF DIURNAL LEPIDOPTERA AT LIGHT

BY J. W. TILDEN
San Jose, California

It has long been noted that certain normally diurnal insects, including representatives of several orders, are occasionally attracted at night to light. Among these insects, a number of butterflies is included, although these species are, at least in our fauna, normally entirely diurnal. The literature on this subject is fairly extensive, and has not been examined exhaustively here, but of special interest is an article by Howard (1898), which reviews a number of papers on the subject. Among the species mentioned in this article as having been taken at light are *Epargyreus tityrus* (Fabr.), *Pholisora catullus* (Fabr.), *Vanessa atlanta* (L.), *Vanessa cardui* (L.), *Vanessa virginiensis* (Drury), *Nymphalis j-album* (Bdv. & Lec.), *Nymphalis antiopa* (L.), *Asterocampa celtis* (Bdv. & Lec.), *Danaus plexippus* (L.), *Papilio troilus* L., and *Lycaenopsis pseudargiolus* (Bdv. & Lec.). Dr. Howard suggests that in some cases these captures may be due to the diurnals going to sleep nearby, and upon being disturbed by some means, they subsequently fly to the light.

Tilden and Mansfield (1942) mention the capture of a specimen of *Lerodea eufala* (Edw.) at light in San Jose, Calif., where this species appears to be uncommon. Other observations so far unrecorded may be included here. In 1931, during both the spring and the fall periods of flight of the skipper, *Poanes melane* (Edw.), several specimens of this species were taken at the lights of the pumping plant on River St., in Santa Cruz, Calif. In each case, the insect was sitting near the light, not fluttering around it. It may be worthwhile to note that in the grounds around the pumping plant, grew *Scabiosa*, *Salvia*, *Aster* and other flowers, attractive to this skipper during daylight hours.

At Vineburg, Sonoma County, Calif., *Ochlodes agricola* (Bdv.) was taken, one male at the lights of a service station, in June, 1933. In September, 1936, another member of this genus, *Ochlodes sylvanoides* (Bdv.), was taken, also at the lights of a service

station, at Gustine, Merced County, Calif. In these two instances, as in the foregoing, the insects were merely sitting near the lights. None of these skippers was observed actually flying to the light.

At Salida, Stanislaus County, Calif., in October, 1932, three specimens of *Vanessa cardui* (L.) were taken, two at the lights of a service station and one at the lights of an auto court. At the same time, a number of specimens of *Colias eurytheme* Bvd. were seen. Both of these species were fluttering actively around the lights.

The latest of such occurrences to be noted was the capture of a specimen of *Vanessa caryae* (Hbn.) at the porch light of a private home near Navarro, Mendocino County, Calif., on the evening of October 3, 1947, at about 9:30 p.m. This specimen was fluttering against the lamp globe of the light.

A tabulation of these records shows several interesting things. The family Nymphalidae is best represented by seven species. The family Hesperiidae is second with six species. Pieridae, Papilionidae, Danaidae, and Lycaenidae are represented by one species each. No Satyridae nor Riodinidae are included. From this it might be concluded that Nymphalidae and Hesperiidae are more susceptible to attraction to light at night than are other families of butterflies. It is also to be noted that in most of the recorded cases, the insects are of common species. It is even more noticeable, however, that some of the most common species are conspicuously absent.

Moreover, all the American species of *Vanessa* have now been recorded as having been captured at light. This is rather remarkable, since this is the only genus, all the species of which have been taken under these circumstances, and it is a matter of interest that behavior so unusual in butterflies should be common to all the members of any given genus in our fauna.

Whether or not Dr. Howard's explanation may be taken to be a valid one is hard to prove or to disprove, but the widespread occurrence of this phenomenon, together with the grouping of captures mostly in two families, would suggest that his is at most only a partial explanation. The habit of being attracted to light would appear to be, in butterflies, a reaction occurring in a relatively small percentage only of the individuals of a species. If the reaction were actually common to a species, one would expect

to find records of many more individuals taken in this manner, or it would have become a matter too well known to be considered curious.

Actually, phototropic behavior varies not only in butterflies, but also in moths. A tabulation of phototropism in moths in any locality would probably show that there are numerous species indifferent to light, and a certain percentage of definitely negative species. Among moths of the latter category may be mentioned members of the genus *Triphosa*, which shun light. At Tucson, Ariz., in April, 1938, it was found that the phalaenid, *Ulosyneda valens* Hy. Edw. was common at the flowers of *Rhus trilobata* Nutt., but indifferent to the light of a Coleman lantern in the immediate vicinity. The rather closely related *Litocola sexsignata* Harv., which was abundant in the same area, was purely diurnal, and was not taken at light. Many other similar examples could be given.

The problem of phototropism is Lepidoptera is far from a simple one. It may be observed that the occurrence of butterflies at light is unusual enough to be of interest, but still by no means so rare as might be supposed.

Literature Cited

Howard, L. O., 1898. Butterflies attracted to light at night. Proc. Ent. Soc. Wash., 4:333-334.

Tilden, J. W., and G. S. Mansfield, 1942. A capture of *Lerodea eufala* Edwards at light. Pan.Pac. Ent., 18(1):26.

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Line 12, p. 171. This should read:
elegans Cr. and further studies may show the *E. hespera* Scullen,

Figure 14, p. 177. The title should read:
Fig. 14. Distribution map for *E. velutina* (2), *E. melanovittata* (4), *E. mellea* (5), *E. hespera* (8), *E. ruficaps* (10), *E. baja* (7), and *E. pacifica* (11).

The Pan-Pacific Entomologist

Vol. XXV, No. 3 July, 1949

NOTES ON NORTH AMERICAN POLISTES WITH DESCRIPTIONS OF NEW SPECIES AND SUBSPECIES

(Hymenoptera, Vespidae)

By Richard M. Bohart
University of California, Davis

The North American *Polistes* wasps can be divided taxonomically in to 4[1] species groups which are widely distributed over the country. These may be called the *canadensis, exclamans, fuscatus* and *major* groups. The structural characters on which they are based have been nicely summarized by Bequaert.[2] The first two can be distinguished from the last two by their more slender form and by the only slightly convex second tergite. The *canadensis* group is further characterized by the distinctly striate propodeum, well punctured mesopleuron and raised pronotal collar. In the *exclamans* group the propodeum is finely striate except in the median groove, the mesopleuron has microscopic punctures only, and the pronotal collar is low and blunt. The *major* group can be separated from the *fuscatus* group by the almost invariably present prepectal suture on the mesopleuron of the former. Also, in the males of the *fuscatus* group the apical sternite has a mediobasal tubercle.

Thanks are due the U. S. National Museum, American Museum of Natural History, California Academy of Sciences, University of California, and Oregon State Agricultural College for the opportunity of studying their extensive collections. Also, Dr. Joseph Bequaert of the Museum of Comparative Zoology at Harvard has contributed and loaned many specimens as well as furnished suggestions and criticisms based on his extensive knowledge of *Polistes*.

[1] A fifth group is represented by *P. pacificus* (Fabricius), a new record of which from Brownsville, Texas, has been communicated to me by Dr. Joseph Bequaert.

[2] Bequaert, J., 1940. An introductory study of *Polistes* in the United States and Canada with descriptions of some new North and South American forms. Jour. N. Y. Ent. Soc. 48:1-32.

Holotypes will be deposited in the California Academy of Sciences. Paratypes will be distributed to the above-named institutions as their number permits.

I. P. CANADENSIS GROUP

P. canadensis (Linn.) in its typical mahogany-colored form occurs in Central and South America. In the United States it is known only from southern Arizona. Other subspecies in this country are the brownish-red *kaibabensis* Hayward from Grand Canyon of Arizona, the yellow, black and orange *navajoe* Cresson from southwestern U. S., and in western Texas the largely orange and black *comanchus* Saussure. Another species of the group, *annularis* Linn. usually has a mahogany thorax and mostly black abdomen. It occurs commonly in eastern and midwestern U. S. and has previously been considered as a subspecies of *canadensis*. However, the male genitalia of *annularis* differ in having the aedeagus considerably stouter.

II. P. EXCLAMANS GROUP

Only one species of this group, *exclamans* Viereck, occurs in the U. S. Structurally speaking, it is separated with difficulty and by male facial characters only from related Mexican and Central American species. Specimens from Lower California appear to be *exclamans* but differ consistently in markings. These are described below.

Polistes exclamans lineonotus R. Bohart, new subspecies

Male—Black, marked with yellow and some reddish. Face mostly yellow, black across vertex and on occiput. Thorax with many yellow spots and lines including 2 pairs of lines on mesonotum and 2 pair on propodeum, pronotum partly reddish. Legs black and yellow or reddish-yellow, hind femora all black except for basal and apical spots. First 2 abdominal tergites mostly black with broad apical yellow bands, rest of abdomen mostly yellow tinged with reddish. Wings brownish red. Length to apex of second tergite 11.5 mm.

Female—Markings about as in male except as follows: face partly suffused with reddish, vertex reddish with black-rimmed ocelli, submedian yellow lines of mesonotum edged with red, mid femur all black except at apex, abdomen mostly brownish red with black at base of segments only, except on tergite I where it runs to apical yellow border. Apical margins of tergites II - III narrow and suffused with reddish, those following broader. Length to apex of second tergite 13.0 - 15.0 mm.

Holotype, male, C. A. S. No. 6002, 10 miles east of SAN IGNACIO, LOWER CALIFORNIA, September 30, 1941 (E. Ross and G. Bohart).

Paratypes, 30 females collected by E Ross, G. Bohart and A. Michelbacher from the following Lower California localities: San Domingo, Venancio, Concepcion Bay, 20 miles N. Comondu; 1 female collected by W. H. Mann at Loreto, Lower California.

The paired yellow lines on the mesonotum of this subspecies differentiate it from the typical form where such lines are absent or very indistinct.

III. P. FUSCATUS GROUP

Included here are *fuscatus* Fabricius from eastern U. S., *variatus* Cresson from central U. S. to the Rocky Mountains, *pallipes* Lepeletier from northern U. S., *centralis* Hayward from southwestern U. S., *aurifer* Saussure from far western U. S. and several localized named forms. These appear to be subspecies, and intermediates occur where they come together geographically. Also included as subspecies by Bequaert (1940, see footnote 2) were *rubiginosus* Lepeletier, *metricus* Say, *bellicosus* Cresson, *apachus* Saussure, *flavus* Cresson, and *hunteri* Bequaert. Although close to *fuscatus* and often structurally indistinguishable in the female, males of these species differ from each other as well as from *fuscatus* in the size and arrangement of the teeth of the aedeagus. The shape of the male clypeus and its position on the face are also useful differentiating characters. In *fuscatus* it is noticeably more concave than in the other species. An addition to the list is the following unnamed form.

Polistes rossi R. Bohart, new species

Male—Light brownish-red and yellow, black restricted to thoracic sutures, margins of ocelli, and mandible teeth. Yellow with orange tint, especially on abdomen, occurring as follows: Clypeus and frons to front of ocellus, anterior and posterior margins of pronotum, tegula basally, narrow propodeal stripes, spot above mid coxa, other indistinct areas on sides of thorax, tibiae and first 2 tarsal segments above, submedially emarginate apical margins of abdominal tergites, similar margins of sternites II - IV, indistinct free spot on tergite II. Wings pale reddish. Clypeus very slightly convex, apex produced at an angle of about 87° (less acute in some paratypes), distance between lateral ocellus and compound eye about 1.3 times diameter of front ocellus, distance between

antennal bases about 1.5 times diameter of front ocellus, last antennal segment in lateral view slightly convex beneath. Propodeum rather sharply cleft at middle, with about 25 distinct and well separated striae. Teeth of aedeagus small (as compared with *fuscatus*), shallow, set close together, similar in size. Length to apex of second tergite 13 mm.

Female—Marked about as in male except that face is yellowish red and propodeum is without stripes. Clypeus produced sharply so that angle is 90° or less. Distance between lateral ocellus and compound eye slightly less than twice diameter of front ocellus. Propodeum as in male but with striae as a rule even more distinct. Length to apex of second tergite 13.5 - 16.5 mm.

Type, male, C. A. S. No. 6003, 10 miles east of SAN IGNACIO, LOWER CALIFORNIA, September 30, 1941 (E. S. Ross and G. E. Bohart). Paratypes, 17 males and 9 females, collected by Ross and G. Bohart except as noted, all from Lower California: 10 mi. E. San Ignacio, 20 mi. S. El Arco, 20 mi. W. San Augustine, El Marmol, Cataviñia, Canipole, La Rivera, Concepcion Bay (Ross and A. Michelbacher), 15 mi. E. San Ignacio (Ross and A. Michelbacher).

This species occurs with a similarly marked subspecies of *fuscatus* which is probably referable to *centralis* but has the abdomen more reddish than in specimens from southwestern U. S. However, *rossi* can be separated on structural characters of the head and propodeum. In other species of the *fuscatus* group the lateral ocelli are separated from the compound eyes in the male by a little more than 2 front ocellus diameters, the male antennal bases are separated by about 2 front ocellus diameters and the last antennal segment in the male is concave beneath in profile. In the females of the other *fuscatus* group species, the clypeal apex is slightly obtuse, and the lateral ocelli are separated from the compound eyes by a little more than 2 ocellus diameters. The propodeum in the *fuscatus* group is subject to some variation in striae, and in *rubiginosus, apachus,* and *metricus* the ridges may be as strong as in some *rossi.* In the subspecies of *fuscatus,* however, fine striae only are found.

P. hunteri Bequaert was treated as a subspecies of *fuscatus* by Bequaert but the small and convex male clypeus and the minutely-toothed aedeagus are characteristic. The known forms of *hunteri* average smaller than any other North American *Polistes.*

In addition to typical *hunteri*, which ranges over much of eastern and southern U. S., there are at least 3 other subspecies. One of these, *neotropicus* Bequaert, notable for the large amount of yellow on the propodeum, was described from Central America but ranges into Texas, New Mexico, and southern Colorado. The other previously unnamed subspecies are described below.

Polistes hunteri californicus R. Bohart, new subspecies

Polistes fuscatus anaheimensis of authors (not Provancher)

Male—Light red marked with yellow as follows: Mandible mostly, face to near ocellar triangle, outer orbit narrowly above and broadly below, anterior and posterior margins of pronotum, spot below tegula, large mesosternal spot, 2 spots at front margin of scutellum, front margin of postscutellum, narrow propodeal stripes, membranous areas at abdominal insertion, front and mid coxae beneath, exterior stripes on femora and tibiae, tarsi partly, rather broad bands on abdominal segments, indented medially, most of tergites III to VII, attached spots on I and II. Black restricted to mandible teeth, irregular area around ocelli, stains along most thoracic sutures and spots on coxae above. Wings reddish, veins brown. Clypeus (as in typical subspecies) small, somewhat convex, removed from eye by about 1.5 times diameter of front ocellus; lateral ocellus removed from eye by about 3.5 times diameter of front ocellus. Last antennal segment not concave or shiny beneath. Aedeagus slender, with many small teeth of about equal size. Length to apex of second tergite 12.5 mm.

Female—Markings about as in male but with yellow more restricted. Most of face including part of clypeus often reddish, mesosternum, coxae and femora except at apex, without yellow. Clypeus adjoining compound eye for about 1 ocellus diameter, lateral ocellus removed from eye by about 3 times diameter of front ocellus. Length to apex of second tergite 10.0 to 14.0 mm.

Holotype, male, C. A. S. No. 6004, ANTIOCH, CONTRA COSTA CO., CALIF. (P. D. Hurd). *Paratypes*, 36 males and 88 females from the following California Counties: Solano (Green Valley), Shasta (Cottonwood), Yolo (Davis, Putah Canyon, Madison), Sacramento, (Sacramento), Stanislaus (Del Puerto Canyon), San Francisco (San Francisco), Eldorado (Chile Bar), Sonoma (Cloverdale), Contra Costa (Antioch), Napa (St. Helena), Lake (Middletown), Alameda (Tesla and Niles Canyon), Inyo (Big Pine), Santa Clara (Stanford University), Monterey (Paraiso Springs), Tulare (Sequoia Park), Madera (Bates), Fresno (Firebaugh), Los Angeles (Saugus, Sierra Madre, Pomona, West Los

Angeles), Orange (Silverado Canyon), Riverside (Andreas Canyon, Banning, Hemet), San Bernardino (El Cajon), San Diego (Borego, San Diego, San Felipe Valley, Jacumba).

The species is common in California at low to moderate elevations as far north as Shasta County. It hibernates particularly under loose bark of cottonwood or eucalyptus and in company with *P. fuscatus aurifer*. Both wasps are stylopized by *Xenos peckii* Kirby but *aurifer* much more frequently so. The nests of *californicus* are usually small but I have collected one containing about 250 cells. It was long oval in shape, with a double pedicel near the middle and individual cells measuring about 5.0 mm. in diameter.

Polistes hunteri clarionensis R. Bohart, new subspecies

Male—Body mostly dull brownish red with restricted yellow and black markings. Yellowish are: face as far up as eye emargination, mid and fore coxae mostly in front, indistinct lines on femora, margins of pronotum weakly, base of abdominal sternite II. Black are: large spot on vertex enclosing ocelli, fourth and following antennal segments except narrowly beneath, spot at middle of humeral slope, thoracic sutures including mesonotum all around and a median stripe extending back as far as tegulae, basal areas on tergites I and II, irregular areas on sternites. Wings reddish, veins brown. Structural characters as in *hunteri* and *californicus*. Length to apex of second tergite 12.0 mm.

Female—Markings about as in male except as follows: small black spot running from each antennal insertion to clypeus, fourth and following antennal segments all black except for tip of twelfth, mesonotum more extensively black, legs with yellow only at tips of fore and mid femora, abdominal tergites (in some paratypes) with traces of sublateral yellow spots. Length to apex of second tergite 12.0 - 16.0 mm.

Holotype, male, C. A. S. No. 6005, CLARION ISLAND, REVILLAGIGEDO GROUP, Pacific Ocean, April 27, 1925 (H. H. Keifer).

Paratypes, 8 males and 49 females, same data as type; 2 females, Clarion Island, March 22-24, 1932 (M. Willows, Jr.), 3 females, Clarion Island, February 27, 1928, (T. Craig).

This subspecies is easily recognized by the decidedly bicolored antennae, the all red propodeum except for a median black stripe, and the absence of yellow on the first abdominal tergite. Mr. H. H. Keifer has told me that nests were numerous near the ground in catsclaw bushes.

IV. P. MAJOR GROUP

Typical *P. major* Beauvois occurs in Mexico and Central America and occasional specimens have been taken in southern Arizona along with the much more common mahogany-colored subspecies, *castaneicolor* Bequaert. The typical subspecies also occurs at Brownsville, Texas, according to information received from J. Bequaert in a letter. In addition I have studied 8 specimens, including both sexes, which represent various intergrades between *major* and *castaneicolor* and which were collected with the other forms in Arizona. In western Texas there is a subspecies, *bakeri* Bequaert, characterized by extensive black areas on the thorax. In southeastern California, subspecies *palmarum* Bequaert can be recognized by its pale reddish color and somewhat restricted yellow markings. In Lower California a similar but more deeply colored subspecies occurs which is described below.

Polistes major slevini R. Bohart, new subspecies

Male—Orange red and yellow with restricted black markings. Mandible, clypeus and frons yellow, ocellar area and occiput irregularly blackened, rest of head reddish. Outlines of pronotum, spots on mesopleuron, coxae beneath, scutellum, postscutellum, area of abdominal insertion yellow, rest of thorax reddish except for blackened sutures, coxae partly and metapleural spots. Abdominal segments with bases of I and II narrowly black, rest reddish with broad apical yellow bands so that IV to VII appear all yellow. Wings reddish brown, veins brown. Length to apex of second tergite 15.0 mm.

Female—Markings about as in male except that ocellar black area is confined to rims of ocelli, scutellum sometimes with small reddish spots. Length to apex of second tergite 17.0 mm.

Holotype, male, C. A. S. No. 6006, LA PAZ, LOWER CALIFORNIA, June 28, 1919 (J. R. Slevin).

Paratypes, 1 male and 6 females from the following Lower California localities: Sierra de la Laguna, Agua Caliente, La Paz and Las Parras.

This subspecies by virtue of its reddish and yellow pattern most closely resembles *palmarum*. However, the red color is darker and the black markings of *slevini*, notably along the pleural sutures, toward the leg bases, at the middle of the propodeum, and at the base of tergites I and II, are absent in *palmarum*.

THE GENUS OROTHRIPS MOULTON

(Thysanoptera: Orothripini)

By Stanley F. Bailey

University of California, Davis

This paper is another in a series on the Aelothripoidea in which we are reviewing, illustrating, and making available all known information on various groups of thrips. Over a period of about forty years the majority of workers in this group of insects have concerned themselves chiefly with describing new species. In North America, particularly, enough is known of this order of insects now to begin bringing together and evaluating our knowledge of certain groups.

Since Moulton's original description of the genus *Orothrips* in 1907, based on *kelloggii*, this worker has described four additional species. It is interesting to note that, like *Erythrothrips*, this genus is also represented in India. In Australia[1], Europe and Africa these genera appear to be replaced by *Desmothrips* Hood, *Melanthrips* Hal., *Allelothrips* Bagn., and *Audiothrips* Moulton. It has been possible, through the kindness of Mr. Moulton, to study all the types of *Orothrips* which are in the Moulton collection and, in addition, the writer has collected and studied many hundred specimens of this genus from the western United States.

On the basis of the presently known species, the genus *Orothrips* is readily divided into two distinct groups, as was originally done by Moulton (1927), on the basis of the shape of the sensory areas on antennal segments III and IV. The value of this character, however, should not be over emphasized. Hood (1936) in his discussion of the new genus *Euceratothrips* was led "to the inescapable conclusion that sensoria are a minor, rather than a major, character in the definition of higher groups, and confirm the writer's repeated contention that such characters, though at once striking and distinctive, are of no great taxonomic moment."

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[1]*Orothrips australis* Bagn., 1914 = *Desmothrips*. Hood, 1915.
Orothrips propinquus Bagn., 1916 = *Desmothrips*. Bagnall, 1928.
Orothrips tenuicornis Bagn., 1916 = *Desmothrips*. ibid.
Orothrips unguttipennis Girault, 1926 = *Desmothrips bagnalli* Karny, 1920. Kelly and Mayne, 1934.

Further, as one studies the aeolothripids and attempts to weigh the better characters in evaluating valid, higher groups, genera and species, the studied opinion of Priesner (1936) can well be considered. This last-mentioned writer states that in studying *Aeolothrips* and employing the sensory areas on the antenna as a specific character "Caution is advocated since one encounters not uncommonly monstrous specimens, and the study of a series of examples is considered necessary to obtain a decision on the specific constancy of the organ in question."

The same author wrote (1936) "In *Melanthrips*, I have found the sensory organs of the 3rd and 4th antenal joint, in spite of certain variations, very reliable for the purpose of separating difficult species." Another character which Priesner found helpful in studying *Melanthrips*, as did the present writer in the case of *Dactuliothrips* and *Ankothrips* (papers previously published in this journal), is the chaetotaxy of the pronotum. So far, it has been unnecessary to use this character in separating *Orothrips* species.

The diversity of the type of sensory areas has been pointed out and illustrated by Priesner for *Melanthrips* in which there are nineteen species. It is possible, therefore, as more species of *Orothrips* become known, (although the genus appears to be a very small one) that the above-mentioned natural grouping may break down. Among various aberrant specimens, the writer has two specimens of *kelloggii* in which the two sensory areas are connected at the tip in the same manner as *Melanthrips nigricornis* Bagn. (see Priesner, 1936, Plate II, fig. 17). Also, we have one male specimen of *yosemitii* in which the sensory areas on segment IV are fused.

Further, on studying a long series of specimens, other variations or oddities are noted. An individual is seen now and then with the number of palpal segments reduced from seven to six, or with the number differing on each palpus of an individual specimen. We have pointed out already the variation in this character in our study of *Erythrothrips* (Bailey, 1947). We have one specimen of *O. yosemitii* with six cross veins on the right fore wing. In general, *Orothrips* collected in the northern portion of their range and at high elevations are darker in color than those taken in central and southern California at low elevation.

The undesirability of establishing families, and even higher categories, then becomes obvious when a few genera only are known which in turn are composed of only a few species, which are based sometimes on single specimens.

In the light of the above discussion, a redescription of the genus *Orothrips* is in order.

OROTHRIPS Moulton, 1907

Antennae nine-segmented, all segments freely articulated. Segments three and four each with two similar sensory areas. Ocelli present with interocellar bristles. Maxillary palpi geniculate and seven-segmented. Labial palpi four-segmented, plus a minute basal attachment. Prothorax wider than long and with a row of strong spines on posterior margin. Fore femora thickened in both sexes. All tibiae armed, the tip of the fore tibiae with two well-developed spines. Second segment of fore tarsus with finger-like hook. Wings present in both sexes, large, bluntly rounded at tip and gradually tapering to base, cross veins present. Fore wings with two broad, dark bands, one near center and one at tip. Scale and extreme basal portion somewhat darker colored than cross bands. Ovipositor upturned. Posterior three abdominal segments taper abruptly, dorsum of last segment not split. Male much smaller than female. Sensory areas on fourth antennal segment very large. Abdomen slender with first segment much longer than second. Genitalia without claspers.

Genotype: *Orothrips kelloggii* Moulton, 1907, by monotypy.

Within the two groups of this genus, species differentiation is difficult since *keeni, raoi,* and *variabilis* were described on minor differences in color and size. The species *keeni* was described as having sensory areas on antennal segment III one-quarter the length of the segment (or 21 microns) and those of segment IV two-fifths its length (or 31 microns). In a long series of *kelloggii,* which includes specimens from Canada, Oregon, Nevada, Arizona, and California, we find the variation in the length of antennal segment III to range from 91 to 130 microns and that of IV from 84 to 123 microns in length. The two sensory areas on each of these two segments are not the same length on each or both segments. Dependent upon the angle of the antenna in the balsam, the depth and density of the balsam, and the degree to which the transmitted light is focused, a variation in the length (and width) of these sensory areas is observed. In the specimens of *kelloggii* studied we have measured the shorter sense area in each case and record the variation of this structure on segments III and IV

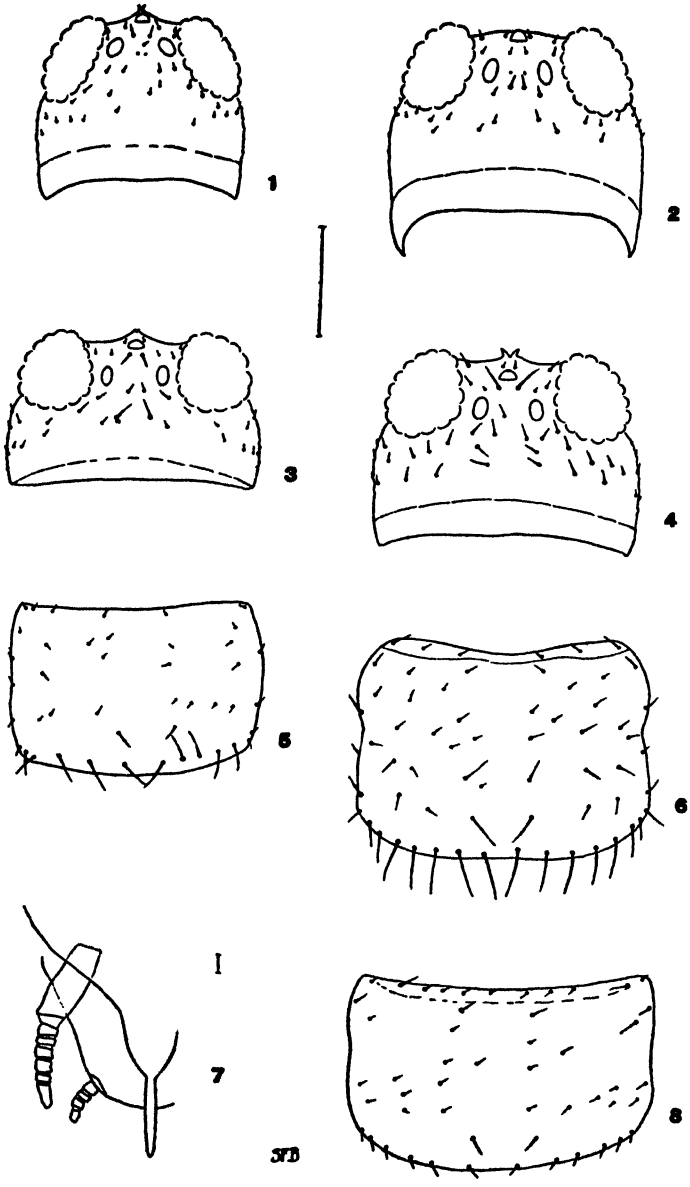

PLATE I

Orothrips. Dorsum of head of: 1, *yosemitii;* 2, *raoi;* 3, *keeni;* 4, *kelloggii.* Pronotum of: 5, *keeni;* 6, *kelloggii;* 8, *yosemitii.* Figure 7, maxillary and labial palpi of *yosemitii.* Scale: Figure 7, line equals 0.01 mm. Figures 1-6, 8, line equals 0.1 mm.

to be from 33 to 49 microns. In general, specimens of aeolothripids nearly always exhibit considerable reddish pigment as well as varying degrees of contrast in grey, black and white on the wings. Further, it should be noted that some years and some individual collections, are more robust, or small, in relation to what might be established as "average." On this basis one might set up varieties of forms which in such a distinctive, small genus is undesirable. The smaller antenna and the differences in the chaetotaxy of the head and pronotum (see figures 3 and 5), when compared with *kelloggii*, appear to set *keeni* apart as a distinct species. However, a series of specimens should be studied to confirm this conclusion and to present more complete knowledge of the extreme variations within the species. We recently collected on *Prunus* at Klamath Falls, Oregon, the type locality of *keeni*, but took only *yosemitii*.

Over a period of years, the writer has collected large numbers of specimens of *Orothrips* in Vacaville and vicinity, the type locality of *variabilis*, but has never been positive of the identity of this species. The species *yosemitii* exhibits the following variations in length in antennal segments: III, 71 to 97 microns; IV, 65 to 84 microns. It will be noted that the measurements given for these segments in *variabilis* by Moulton fall within the extremes. Also, there is as much as fifty per cent variation in the diameter of the oval sensory areas on segment III of *yosemitii*.

The only other known species with oval sensory areas, *raoi* from India, likewise is almost identical with *yosemitii*. A study of a series of exotic specimens in the future may bring forward sufficiently distinctive characters to make more accurate separation possible. At present we are able to give only a provisional key to the described species. While the key to the species given below is based largely on the sensory areas and length of antennal segments III and IV, there seems to be no other way to separate these species at present. In the illustrations accompanying this paper, the similarity of the head of *raoi* and *yosemitii* will be

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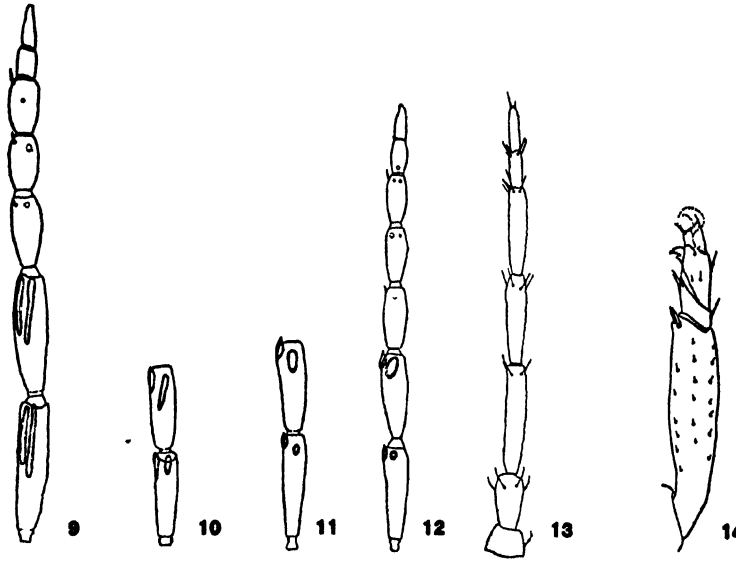
PLATE II

Orothrips. Antenna of: 9, *kelloggii* (segments 3-9); 10, *keeni* (segments 3 and 4); 11, *raoi* (segments 3 and 4); 12, *yosemitii* (segments 3-9); 13, mature larva of *yosemitii*. Figure 14, front tarsus of *yosemitii*. Terminal (dorsal) abdominal segments of: 15, *kelloggii*, male; 16, *yosemitii*, female; 17, *kelloggii*, mature larva. Scale: Figure 9-17, line equals 0.1 mm.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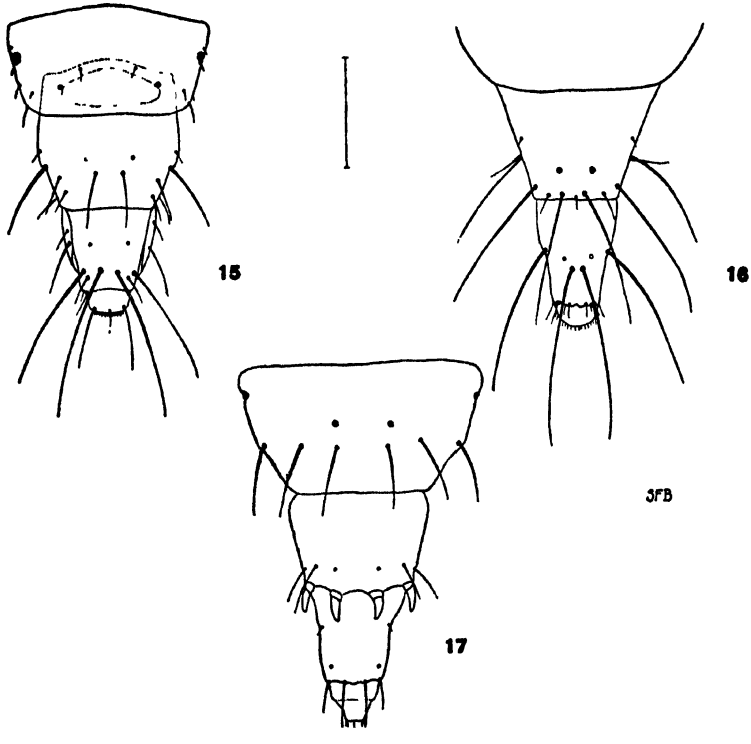
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noted. There is even a greater similarity in the pronotum of these two species. The type slide of *variabilis* has two specimens mounted thereon, one laterally and one dorsally. We consider *variabilis* to be a synonym of *yosemitii* as it falls into the extreme range of color and size when a long series is studied. There are insufficient outstanding characters on the terminal abdominal segments to enable one to construct a key to the males. Furthermore, the males of *keeni* and *raoi* are unknown.

Provisional Key to the Species of Orothrips

1. Sensory areas on antennal segments III and IV elongated and definitely linear, two to each segment 2
– Sensory areas on antennal segments III and IV round or oval, two to each segment 3
2. Sensory areas on antennal segment III about one-fourth length of segment which is about 84 microns in length. Antennal segment II brown in color similar to body, segment III light brown in basal third. Total body length about 1.6 mm..... *O. keeni* Moulton, 1927 (W. No. America)
– Sensory areas (about 50 microns in length) on antennal segment III extending nearly to center of segment which is 91 to 130 microns in length. Antennal segment II brown or with tip light brown, segment III yellowish brown in basal half. Remainder of segments brown. Total body length about 2.4 mm..... *O. kelloggii* Moulton, 1907. (W. No. America)
3. Sensory areas on antennal segment III almost equal in size, irregularly oval and the smaller one from 9 to 13 microns long by 6 to 11 microns wide. Antennal segment II dark brown at base shading to yellowish brown at tip, segment III yellow to yellowish brown in basal half. Remainder of segments brown. Antennal segment III, 71 to 97 microns in length. Total body length about 1.6 mm ..... *O. yosemitii*[2] Moulton, 1911 ..... and *O. variabilis* Moulton, 1927 (W. No. America)
– Sensory areas on antennal segments III and IV oval, and nearly all equal in size. Length of antennal segment III, 105 microns. Total body length 1.58 mm..... *O. raoi* Moulton, 1927 (India)

Catalog of the Species of Orothrips Moulton, 1907

1. KEENI Moulton, 1927. North America. Oregon: Klamath Falls. *Prunus emarginata.* May. Known from original collection only. Slide No. 902. Holotype.

2. KELLOGGII Moulton, 1907. Genotype. North America. British

[2]The original spelling of this name by Moulton has been retained rather than that used by the same writer in 1927 (i.e. *yosemitei*).

Columbia, Oregon, Arizona, California: Widely distributed. Manzanita and madrone blossoms, Arbutus, plum and *Prunus demissa*. January to June. Slide No. 179 ("holotype"), 2 females.

New records: Talent, Oregon, plum, March 5, 1941. L. G. Gentner. Prescott, Arizona, manzanita, March 2, 1925. W. W. Jones. Bayles, California, manzanita, March 16, 1939. A. T. McClay. Huntington Lake, California, manzanita, June 27, 1948. A. T. McClay. Malahat, Vancouver Island, B. C., madrone, June 17, 1948. S. F. Bailey.

3. RAOI Moulton, 1927. India, Bangalore. Host plant unknown. Known only from original collection. Holotype slide No. 1226.

4. YOSEMITII Moulton, 1911. North America. British Columbia, Wyoming, Oregon, Washington, California: Widely distributed in foothills to 8100 feet elevation. *Amelanchier*, grass and flowers of live oak, *Ceanothus*, Manzanita and plum. March to July. (One collection only of "variabilis" is known, i.e. Vacaville, California, from Cherry blossoms in May). Slide No. 101 ("holotype"), 2 females. "Holotype" slide of *variabilis*, with no number, is of two females also.

New records: Pospect, Oregon, sweeping, June, 1938. A. T. McClay. Klamath Falls, Oregon, *Prunus demissa*, June 10, 1948. S. F. Bailey. Mt. Rainer Nat'l. Park (East side), Wn., flowering shrub, June 19, 1948. S. F. Bailey. Satus Pass, Wn., *Ceanothus;* June 19, 1948. S. F. Bailey. Russellman Park, Mt. Diablo, California, sweeping grass, April 8, 1936. S. F. Bailey. Emerald Bay, Lake Tahoe, California, *Ceanothus*, July 7, 1939. S. F. Bailey. Kit Carson Pass, California, sweeping wild flowers, July 1, 1936. S. F. Bailey. Cajon Pass, California, *Ceanothus*, April 12, 1936. R. M. Bohart. Jenny Lake, Wyoming, *Ceanothus*, June 21, 1940. G. F. Knowlton.

Like most of the aeolothripoid members of this group of insects, *Orothrips* species reach their greatest seasonal abundance in the spring. The first species to appear is *kelloggii* which may be found as early as December in the blossoms of manzanita and madrone, chiefly at low elevations. As these hosts continue to bloom, northward and upward, we have found this thrips as late as May and as high as 7000 feet. The adults oviposit in the flowers and the larvae feed therein (Moulton, 1927). When fullgrown, the yellow larvae (with distinct pink bands around the abdominal segments) drop to the soil beneath the hosts. After finding a suitable crevice several inches below the surface, they spin a cocoon

(Bailey, 1940) and there pass the remainder of the year. The other common species, *yosemitii*, has a similar seasonal cycle and habits. It is found chiefly in *Ceanothus* flowers and appears from March at lower elevations to July in the high mountains. Its distribution appears to be limited by that of *Ceanothus* species on which it has been collected up to 8100 feet elevation. Both of the above discussed species are very common and undoubtedly occur throughout the far western states. These thrips have only one generation a year.

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STUDIES ON THE COLEOPTERA OF THE PACIFIC NORTHWEST I

BY MELVILLE H. HATCH
University of Washington, Seattle

The author is working on a handbook of the Coleoptera of the Pacific Northwest. It is his intention to publish under the above title such bibliographic and taxonomic notes, including new species, as come to his attention, in order that the pages of his book may be kept free from such specialized material. Unless otherwise noted, the specimens on which these studies are based are in the collection of the author at the University of Washington.

CICINDELIDAE

CICINDELA LIMBALIS var. ELDORENSIS Csy.

This species is cited by Blackwelder in the Fourth Supplement to the Leng Catalogue (1939, p. 7) from "Ore." in error. The type locality is Eldora, Colorado.

CICINDELA COLUMBICA Hatch

Hatch, Univ. Wash. Publ. Biol. V, 1938, p. 234. I am now convinced this form has no special affinity with *bellissima* Leng. It most closely resembles *repanda* Dej., from which it is distinguished by the obtusely rather than subrectangularly angulate median elytral band.

CARABIDAE: CARABINAE

SCAPHINOTUS (PSEUDONOMARETUS) MERKELI Horn.

Roeschke, Ann. Mus. Nat. Hungarici V, 1907, p. 161, regards *idahoensis* Webb as a geographical race. I find the *merkeli*-form from the western portion of St. Joe National Forest, a point between the type locality of *idahoensis* near Moscow and the western portion of Coeur d'Alene National Forest, whence I have a least subtypical *idahoensis*. Accordingly, I reduce *idahoensis* to the status of a variety.

SCAPHINOTUS (NEOCYCHRUS) ANGULATUS Harris var. MARITIMUS Van Dyke

Van Dyke, Ent. Amer. XXIV, 1944, p. 12, reports this black phase of *angulatus* from Port Angeles, Olympic National Forest,

Hoquiam, and Melbourne, and regards it as a geographical subspecies. I have a single specimen from Seattle, where typical *angulatus* occurs, so that I suspect it is a nongeographical variety.

CYCHRUS (CYCHRUS) RICKSECKERI LeC.

In view of the fact that the range of this form (Idaho north of Coeur d'Alene and adjacent portions of Washington, British Columbia, and Montana) is separated by three or four hundred miles from that of *hemphillii* Horn, I suggest we return to LeConte's original conception of it as a distinct species.

CARABUS (MEGODONTUS) VIETINGHOFFI Ad.

Horn, Can. Ent. VIII, 1876, p. 127, says "this species is found in Alaska and extends its habitat *towards* British Columbia..." (italics mine), but this is an insufficient basis for listing it *from* British Columbia as is done by Breuning, Mon. Gatt. Carabus, 1935, p. 1212, and Blackwelder, Fourth Suppl. Leng Cat. Col. Am. n. of Mex., 1939, p. 11.

BLETHISA OREGONENSIS LeC.
(*columbica* Csy.)

Horn, Trans. Am. Ent. Soc. V, 1876, p. 247, distinguished *oregonensis* from *B. multipunctata* L. on the basis of the smooth ventral surface of the prothorax. Casey, Can. Ent. XLI, 1909, p. 277, described *columbica* with the prosternal side pieces punctate behind. My series shows variation from the virtually impunctate condition to one in which the side pieces are densely punctate except along the apical margin, a close approach to my examples of *multipunctata*, in which the entire side piece is densely and in part confluently punctate.

Notiophilus lanei Hatch, *sp. n.*

Dark bronze above, shining, elytra at times with an obscure lateral pale vitta that is usually apical but may be nearly entire, below shining black, the four basal antennal segments and legs, especially the tibiae, somewhat paler; head with front with five entire striae between the broad lateral grooves, the vertex opaquely alutaceous; pronotum three-fifths as long as wide, the sides broadly feebly arcuate in front, feebly sinuate before the rectangular hind angles, the disc broadly impunctate, the margins coarsely punctate or punctato-rugose, the basal impressions large and densely punctate and alutaceous; elytra coarsely punctato-striate, the second

and third striae fine towards apex, the second stria equidistant between the first and fifth, the apex alutaceous and with two ocellate punctures, the second to sixth intervals not or just visibly alutaceous, the third interval with a single dorsal puncture behind the basal fourth; length 4.5 - 5 mm.

Type and six *paratypes*: PIERCE, IDAHO, August 30, 1933; M. H. Hatch. One paratype: Waha, Idaho, August 31, 1933; M. H. Hatch; one paratype: Bobs L., B. C., June 13, 1939. Named in honor of Mr. M. C. Lane, with whom the specimens were taken.

In Fall's key, Psyche XIII, 1906, p. 82, this species comes between *simulator* Fall and *novemstriatus* LeC. From both of these and from *sylvaticus* Esch. it is distinguished by the position of the second elytral stria midway between the first and fifth. From *simulator* it is distinguished further by its more coarsely punctate more deeply impressed elytral striae and from *novemstriatus* by its larger size. Feebly vittate examples are distinguished from the strongly vittate *sylvaticus* by the virtually smooth or very feebly alutaceous second to sixth elytral intervals, which are evidently alutaceous in that species.

LEISTUS FERRUGINOSUS Mann.

According to Bänninger's key, Ent. Mitteil. XIV, 1925, p. 332, this species belongs in the subgenus *Leistophorus* Reitter and not in *Leistidius* Daniel, as Bänninger surmizes (p. 335). I can discover no reason for maintaining *nigropiceus* Csy., Mem. Col IV, 1913, p. 45, as distinct. Both are amply distinct from the European *L.* (*Leistidius*) *piceus* Froh., recorded probably on the basis of an adventitious specimen from Fitchburg, Massachusetts by LeConte, Trans. Am. Ent. Soc. V, 1875, p. 169.* In *piceus* the elytral humeri are oblique and virtually obsolete, the sides of the pronotum in front of the obtuse hind angles obliquely sinuate. *Ferruginosus* has the humeri well developed and arcuate, the sides of the pronotum in front of the sharply rectangular hind angles subparallel and strongly sinuate.

Nebria melanaria Hatch, *sp. n.*

Black, head between eyes with two rufous spots; pronotum with side margins widely reflexed, with a seta-bearing puncture at each hind angle and along either lateral margin in front of middle (seta broken in paratype), the side margins obliquely slightly

*C. H. Frost (*in litt.*) states that he knows of no other specimens from New England.

divergent in front of the acute hind angles; elytra with well developed humeri, the finely punctate striae finely impressed, the intervals flat or feebly convex, the third and seventh intervals with three to five dorsal punctures, these sometimes producing a subcatenate appearance, the fifth interval without or with a single dorsal puncture; abdominal sternites three to five with two or three seta-bearing punctures on each side of the middle along the posterior margin; length 10.5 - 11 mm.

Type and *paratype* male: GLACIER NATIONAL PARK, MONTANA, Going-to-the-Sun Chalet, August 26, 1939, M. H. Hatch. Except for its black color, this species resembles *gebleri* Dej., with specimens of which it was taken under stones on the beach of St. Mary Lake. It may be a variety of that species, but I know of no other instance in which one of the metallic species of *Nebria* loses its metallic color. In Hatch's key, Pan-Pac. Ent. XV, 1939, pp. 117-122, it runs to *trifaria* LeC. and *vandykei* Bänn., from which it is distinguished in part by its smaller size, more prominent elytral humeri, and less strongly catenate elytral intervals.

Dyschirius subpunctatus Hatch, *sp. n.*

Black, shining, above bronzed or cyanescent, base of antennae and legs more or less rufous; head with clypeus broadly emarginate, the bottom of the emargination feebly arcuate to evidently lobed, the front finely transversely impressed; pronotum globose, as long as wide, the apical and basal transverse impressions and the median line evident; elytra not margined at base, eight striate, the first seven well impressed, obsolete towards extreme base, well impressed at apex, finely sparsely punctate at base, impunctate behind middle, the third interval with an ante-median and a posterior setigerous puncture near the third stria, the humeri well developed; protibiae not dentate without; length 3.8 - 4.7 mm.

Type and 62 *paratypes*: VANTAGE, WASHINGTON, April 24, 1936, M. H. Hatch. 12 paratypes: Lyons Ferry, Wash., September 16, 1930, M. H. Hatch. 16 paratypes: Cicero, Fort Canby, Kittitas, Ocean Park, Orting, Renton, Vantage, and Vila in Washington. Four paratypes: Condon, Multnomah Falls, Salem, Tygh Valley in Oregon. The Vantage and Lyons Ferry specimens were obtained by washing water over sand banks by the river.

Distinguished from the eastern *sphaericollis* Say by the smaller punctures of the elytral striae.

Dyschirius thompsoni Hatch, *sp. n.*

Black, shining, legs and antennae more or less obscure rufous; head with clypeus broadly emarginate, the bottom of the emargination nearly straight, the angles prominently narrowly lobately rounded, the front with a deep transverse impression that is narrowly interrupted at middle; pronotum quadrately globose, nine-tenths as wide as long, the apical transverse impression and median line feeble, the basal transverse impression deep; elytra not margined at base, seven striate, the sutural stria deeply impressed, striae two to seven finely impressed, obsolete towards extreme base and feeble towards apex, finely distantly punctate on basal half, evanescently punctate behind middle, without dorsal punctures, the humeri well developed; protibiae more or less finely dentate without; length 2.75 - 3 mm.

Type and five *paratypes*: CONDON, OREGON, June 20, 1938, M. H. Hatch. Two paratypes: Lyons Ferry Wash., September 16, 1930, M. H. Hatch; Walla Walla, Wash., IV-1-10-1943, flying M. C. Lane. This species appears to run most closely to *aratus* LeC. from California in LeConte's key (Bull. Brooklyn Ent. Soc. II, 1879, pp. 18, 31), which is described with the "clypeus sharply bidentate." Named in honor of Prof. B. G. Thompson of the Oregon State College, whose guest I was when the type series was collected and to whom I am indebted for numerous other entomological favors.

Dyschirius alternatus Hatch, *sp. n.*

Piceous black, shining, elytra and abdomen black, legs and antennae more or less rufous; head with clypeus broadly emarginate, the bottom of the emargination straight, the angles prominently produced and acute, the front with a transverse impression; pronotum globose, nearly as long as wide, the anterior transverse impression and the median line feeble, the transverse basal impression distinct; elytra not margined at base, seven striate; the sutural stria distinctly impressed; second, third, and fourth striae feebly impressed; the striae coarsely distantly punctate on basal half, the striae beyond the second virtually effaced apically; fifth, sixth, and seventh striae unimpressed series of punctures; first third, fifth, and seventh intervals and impressed marginal stria with series of minute setigerous punctures; humeri well developed; protibiae minutely dentate without; length 2.25 mm.

Type: GRAND COULEE, WASHINGTON, Dry Falls, May 1, 1937, M. H. Hatch. Runs to the eastern *setosus* LeC. in LeConte's key (l.c.) from which it is separated by its smaller size.

CLIVINA FOSSOR L.

elongata Randall, Boston Jour. Nat. Hist. II, 1938, p. 34.
var. ♀ *collaris* Hbst., Jeannel, Faune de France 39, 1941, p. 257.

This widely distributed Palaearctic species was apparently introduced over a century ago at Boston, Mass. (Randall, l.c.). It has since been recorded from Cincinnati (Dury, Jour. Cinc. Soc. Nat. Hist. II, 1879, p. 162), Montreal (Fall, Ent. News XXXIII, 1922, p. 162), and Mobile (Loding, Geol. Surv. Alab. Mon. 11, 1945, p. 12). In northeastern North America it is still apparently rare, since C. H. Frost writes me that the only American examples in his collection are two specimens of *collaris* taken at Stoneham, Mass., around 1902 to 1908 and two specimens of *fossor* from Dartmouth, Nova Scotia taken in 1947. This species was taken first in western Washington in 1937 (Bothell), in 1938 at Juanita Beach near Seattle, at Seattle in 1941, at Renton near Seattle in 1944. Fall's notes will enable its tolerably certain recognition. In addition I have found the anteriorly feebly arcuate distinctly convergent side margins of the pronotum useful in distinguishing it from *impressifrons* LeC. and *oregona* Fall. Specimens approximating the *collaris*-form are present in my series.

SCHIZOGENIUS DEPRESSUS LeC.

I find the rufous and black forms together so regularly in Oregon and Washington that I suspect that the black *litigiosus* Fall is simply a color phase of *depressus*.

A NOTE ON SIREX AREOLATUS (CRESSON)

(Hymenoptera, Siricidae)

In removing some small (10 inches in diameter) Douglas fir stumps which had been buried for about a year by a loose fill, a number of individuals of this species were found in the pupa stage and some recently transformed adults. Some of the pupal cells were in the soggy sapwood, but some of the larvae had emerged from the wood and transformed in the soil.

Such a procedure seems strange for Siricidae and no such habit seems to have been reported.

Perhaps it is merely a case of our observations not having been very thorough.—W. J. CHAMBERLIN, *Oregon State College.*

DESCRIPTIONS OF SOME WESTERN LIMNEPHILIDAE
(Trichoptera)

BY HERBERT H. ROSS
Illinois Natural History Survey, Urbana, Illinois

The species recorded in this paper come chiefly from the Cascade Mountain region of Oregon and Washington. I am deeply indebted to Kenneth M. Fender, Stanley G. Jewett, and Hugh B. Leech for procuring most of the material on which the paper is based. Types are deposited in the collections of the Illinois Natural History Survey (INHS) or the California Academy of Sciences (CAS).

LIMNEPHILUS Leach

Limnephilus lopho Ross, new species

This species is most closely related to *cockerelli* Banks and *harrimani* Banks, the male differing from both in having the cerci shorter than the lobes of the tenth tergite, and in the very distinctive feature of possessing a large, padlike, sclerotized lateral lobe which appears as a ventrolateral subdivision of each lobe of the tenth tergite, fig. 1.

Male—Length 13 mm. Head, scape, body, and legs to tip of femora dark brown; flagellum, palpi, and legs beyond femora, very pale brown, the legs with black spines; wings light brown with darker brown markings along the veins and along the posterior edge. General structure typical for genus. Head bears one large and several small pale macrochaetae mesad of, and slightly posterior to, each lateral ocellus. Pronotum bears many stout macrochaetae. Front legs have a row of minute black spicules on the ventral margin of the femur, starting at the base and gradually fading out about halfway to the apex; basitarsus one and one half times the length of succeeding segment. All legs with apical segment of tarsus having none to three short black spines; in one series of five specimens, two individuals have no spines on any apical segments. Eighth tergite with only a few scattered short setae on apical margin, its meson not produced into a lobe.

Genitalia as in figs. 1, 1*A*, and 1*B*. Ninth segment narrow both dorsad and ventrad but fairly long along the lateral dimensions. Cerci not extending posteriad as far as lobes of tenth tergite; each cercus in lateral view is almost parallel-sided, moderately wide

and rounded at apex, bearing a scattering of long setae; from dorsal view each is slightly thickened at base, rounded at apex, and bears a heavily sclerotized mesal area toward the tip. Claspers reduced to a small triangular lobe with a short posterodorsal projection and bearing about eight long, black, slender setae in addition to the shorter vestiture. Each lobe of tenth tergite has a long, deep, dorsal portion, its posterior margin oblique and almost straight, its upper corner fairly sharp, the posterior half of the lobe heavily sclerotized; below and to the side of this dorsal lobe is a smaller, flat, padlike structure also heavily sclerotized and reticulate; in uncleared specimens, this lobe fits tightly against the dorsal lobe and is easily overlooked. Aedeagus elongate, fig. 1*B*, the central portion slightly swollen at base and curved up into an ovoid tip; each lateral arm is heavily sclerotized, and bent up sharply at the apex, the apex bearing a thick brush of moderately long and stout hairs.

Female—Length 14 mm. Color, including wings, mostly tawny with scattered areas of darker brown, and with the dorsum of abdomen and venter of both thorax and abdomen moderately dark brown. General structure typical for genus. Genitalia as in figs. 1*C* and 1*D*. Subgenital plate with narrow mesal tongue, lateral lobes with ventral flap overlying most of dorsal flap. Ninth segment narrow dorsally, the ventral portion forming a single broad area slightly incised on the meson at apex. Cerci large, fused at base with base of tenth segment. Tenth segment with dorsum sharply notched for a short distance, the ventral portion incised almost to base and thus forming what appear as two sclerotized lateral flaps.

Holotype, male, HOOD RIVER MEADOWS, MT. HOOD, OREGON, July 17, 1948, K. M. Fender (INHS).

Allotype, female, Mt. Hood Meadows, Mt. Hood, Oregon, July 31, 1948, K. M. Fender (INHS).

Paratypes, same data as for holotype, 4♂; same data as for allotype, 13♂, 16♀. Paratypes are deposited in the collections of the California Academy of Sciences and the Illinois Natural History Survey.

Limnephilus santanus Ross, new species

On the basis of general appearance and size, this species appears related to *fumosus* Banks. The female of *santanus* differs from the female type of *fumosus* in the structure of the subgenital plate and in having the long dorsal processes of the tenth segment slender and light rather than heavily sclerotized and bladelike.

Male—Length 18 mm. Head and thorax dark brown, almost black, with a few lighter brown areas along the sutures; antennae dark brown with the apex of each segment lighter; palpi and mouth parts yellow, as is the adjacent area of the head; legs below coxae yellow with black spines; abdomen a moderate shade of brown; front wings chocolate brown with conspicuous straw-colored clear areas, including large spots at the end of cells R_s, M_s, and M_s, at the base of the cells forming the cord, most of the costal cells, and a diagonal stripe from base of stigma to Cu_1a, the remainder of the wing variegated with small pale spots; hind wing straw-colored except for the apex of the wing which is suffused with darker color, especially on the anterior corner. General structure typical for genus. Head bearing a stout white macrochaeta posteromesal to each lateral ocellus. Warts of scutum poorly defined. Front legs with basitarsus one and a half times length of next segment; femur elongate and slender, with a narrow brush of very short black spinules along posteromesal margin, starting at base and gradually fading out beyond the middle of the segment. Abdomen with eighth tergite similar to seventh, without posteromesal projections or brushes.

Genitalia as in figs. 2, 2*A*, and 2*B*. Ninth segment narrow ventrally, reduced to a fairly sharp angle dorsally. Cerci stout, very convex laterally, the apical margin sclerotized and broken into small black teeth, the two cerci touching on the meson at extreme base. Claspers projecting and pointing, clothed with long pale setae. Tenth tergite divided into a pair of narrow upturned lobes, heavily sclerotized at apex. Aedeagus, fig. 2*B*, with base of central process striate at base with folds of membrane; lateral arms sinuate, upturned at apex, each with a mesal fold bearing long spines, the extreme apex bearing whorls of spines and a few stouter ones at tip.

Female—Similar in size and general characteristics to male. Genitalia as in fig. 2*C*. Subgenital plate with narrow mesal tongue which is longer than lateral lobes; each of the latter broad at apex, the ventral flap occupying not more than half of the area of the lobe. Ninth sternite almost completely divided on meson to form a pair of rounded lateral lobes. Cerci elongate and somewhat pear-shaped, appressed on the meson and overlying very closely the tenth segment. Tenth segment almost completely divided into dorsal and ventral parts, the dorsal portion forming a pair of slender, curved, weak processes, concave below, the ventral portion forming a stout vasiform structure narrowed at apex, its mesal margin excavated.

Holotype, male, ODELL LAKE, OREGON, August 1, 1948, K. M. Fender (INHS).

Allotype, female, same data (INHS).

Paratypes, Pringle Falls Experiment Station, Oregon, June 7, 1935, V. E. Shelford, 1 ♂ (INHS); Marion Lake, Oregon, July 1, 1936, 3 ♂, 2 ♀ (D. G. Denning and INHS).

Limnephilus frijole Ross

A collection of this species from Adobe Creek, Stanislaus County, 12 miles west of Patterson, California, May 23, 1948, Hugh B. Leech, extends the range of this species from the southeastern Rockies into the Western ranges. The two California males check very well with the holotype from Texas but differ slightly, fig. 3, in having the claspers noticeably longer. Other details of the genitalia are almost identical. In the original description a quartering view is given of the inner surface of the cercus. I am including here a straight mesal view to show the relationship between the apex of the tenth tergite and the inner toothed lobe of the cercus.

This species is of more than usual interest in that characters of the genitalia indicate a fairly close relationship with *lunonus* Ross; in *frijole* the front basitarsus is very short, but in *lunonus* the front basitarsus is equal in length to the second.

Chyranda Ross

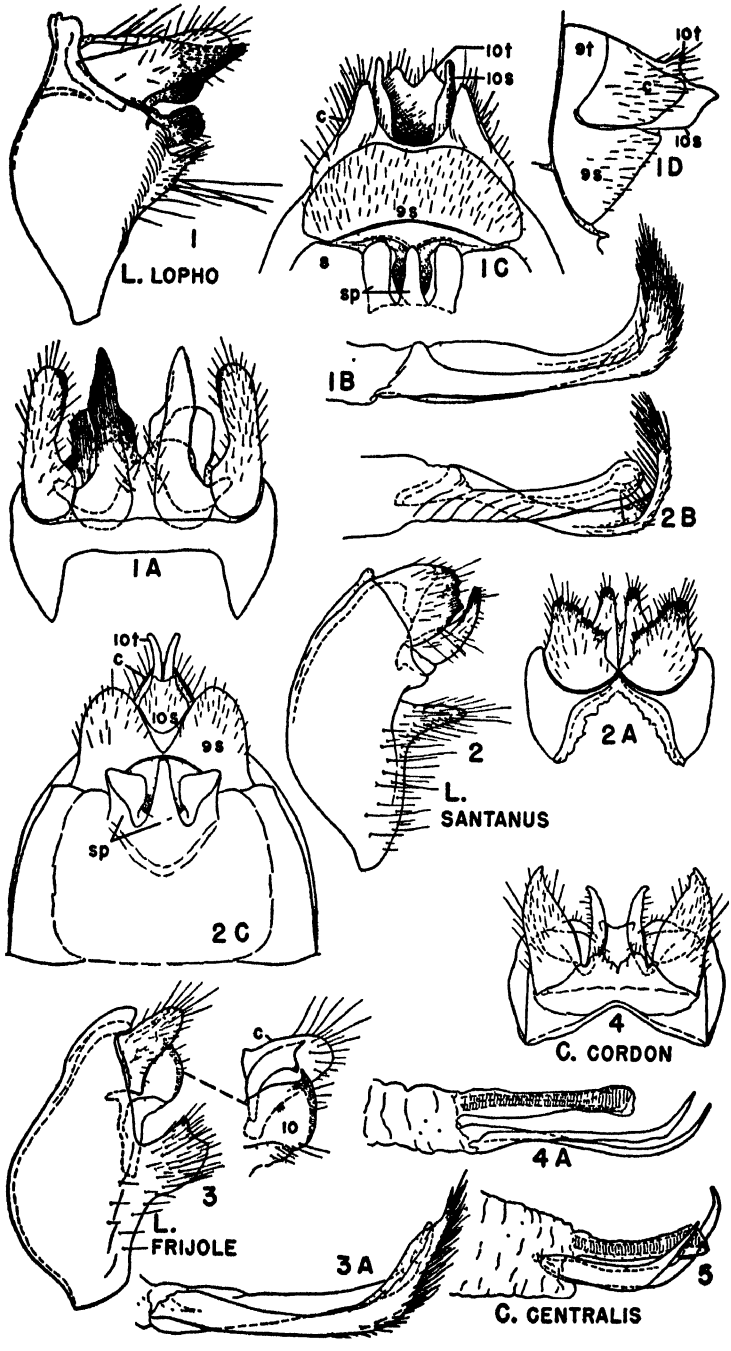
Chyranda cordon Ross, new species

The general outline of male genitalia in this species is very similar to that of *centralis* (Banks), but *cordon* differs in the slender, elongate, and similar lateral arms of the aedeagus, fig. 4*A*, and the emarginate tenth tergite and the sclerotized flanges which run lateroventrad from it; *centralis* has the two lateral arms of the aedeagus extremely asymmetrical and with the apical half sharply angled dorsad, fig. 5, and the flanges of the tenth tergite indistinct.

Explanation of Plate I

Fig. 1. *Limnephilus lopho*, male genitalia, lateral aspect; 1*A*, male genitalia, dorsal aspect; 1*B*, aedeagus, lateral aspect; 1*C*, female genitalia, ventral aspect; 1*D*, female genitalia, lateral aspect; Fig. 2. *Limnephilus santanus*, male genitalia, lateral aspect; 2*A*, male genitalia, dorsal aspect; 2*B*, aedeagus, lateral aspect; 2*C*, female genitalia, ventral aspect. Fig. 3. *Limnephilus frijole*, male genitalia, lateral aspect, inset showing mesal aspect of tenth tergite and clasper; 3*A*, aedeagus, lateral aspect. Fig. 4. *Chyranda cordon*, male genitalia, dorsal aspect; 4*A*, aedeagus, lateral aspect. Fig. 5. *Chyranda centralis*, aedeagus, lateral aspect.

Abbreviations used: *c*, cercus; *s*, sternite or sternal portion; *sp*, subgenital plate; *t*, tergite or tergal portion.


1
L. LOPHO
1C
1D
1B
1A
2B
2
L.
SANTANUS
2A
2C
4
C. CORDON
4A
3
L.
FRIJOLE
3A
5
C. CENTRALIS

Male—Length 14 mm. Color brownish-yellow throughout, the antennae slightly darker and the leg spines black. General structure typical for genus. Male genitalia similar in general proportions to those illustrated for *centralis* (Ross, 1938, fig. 45). Ninth segment reduced to a narrow strap dorsad, wide in the middle, and narrowed to a point ventrad.

Genitalia as in figs. 4 and 4*A*. Cerci large and earlike, rounded at apex; each bears a mesal, curved, bladelike process nearly as long as the outer portion, the two hinged at base but indubitably connected with each other, fig. 4. Tenth tergite represented by a large triangular plate which fills up the space between the top of the claspers and the base of the cerci, this plate not bearing the usual conspicuous paired lobes considered typical of the tenth tergite, but instead a pair of raised diagonal flanges arising near the ventrolateral corner of the sclerite and terminating at the dorsomesal corner (between the mesal processes of the cerci) in a short stout projection emarginate from dorsal view. Claspers broad and deep, appressed to the ninth segment and appearing to be only sclerites of it. Aedeagus, fig. 4*A*, with a moderately stout mesal process and with a pair of lateral processes which are almost identical in size and shape, much longer than the mesal process and upcurved at apex.

Holotype, male, PEAVINE RIDGE, MCMINNVILLE, OREGON, Station 3A, September 6, 1946, K. M. Fender (INHS).

Paratype, Beaver Cr., Mt. Hood, Oregon, August 1, 1948, K. M. Fender (INHS).

PHILOCASCA Ross

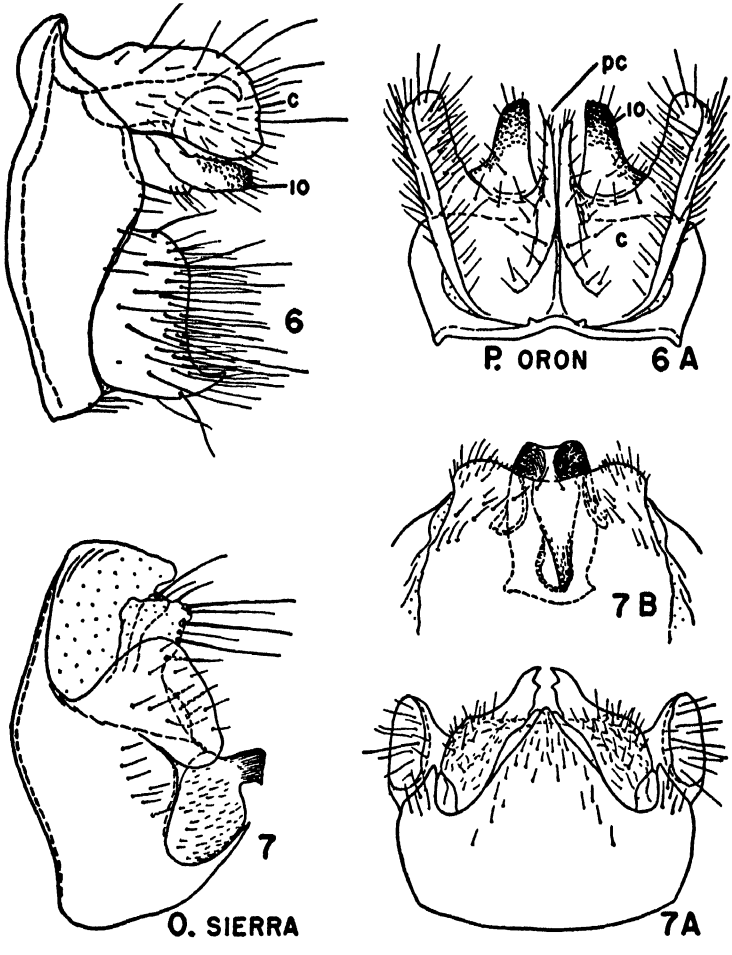
The species described below brings to three the number known in this genus. Only the males are known, and they may be separated by the following key:

KEY TO SPECIES (MALES)

1. Cerci having two pairs of mesal fingerlike processes (Denning 1941, fig. 11) ..... *banksi* (Denning)
– Cerci having only one pair of mesal processes 2
2. Mesal processes of cerci slender and fingerlike from both lateral and dorsal view and curved ventrad at tip, figs. 6, 6*A* ..... *oron* Ross
– Mesal processes of cerci slender from dorsal view, but wide and bladelike from lateral view and straight (Ross 1941, fig. 89) ..... *demita* Ross

Philocasca oron Ross, new species

Male—Length 15 mm. Color throughout light yellowish brown, the venter nearly straw color, the front wings slightly darker, many of the body hairs and most of the leg spines dark brown or black. General structure typical for genus.



EXPLANATION OF PLATE II

Fig. 6. *Philocasca oron*, male genitalia, lateral aspect; 6*A*, male genitalia, dorsal aspect. Fig. 7. *Oligophlebodes sierra*, male genitalia, lateral aspect; 7*A*. male genitalia, ventral aspect; 7*B*, female subgenital plate showing spermatheca.

Abbreviations used: *c*, cercus; *pc*, mesal process of cercus.

Male genitalia as in figs. 6 and 6A. Ninth segment narrow and straplike dorsad, only moderately wide in middle, reduced to about half its lateral width ventrad. Cerci large and irregular in outline from lateral view, the mesal process of each slender and curved ventrad at tip. Claspers large and deep, the ventral corner produced into a sharp posterior point. Tenth tergite with a pair of heavily sclerotized processes enlarging toward base and fusing almost completely with ventral portion of central part of each cercus. Aedeagus with a large ventral membranous mesal portion above which are a pair of long curved sclerotized rods which arise from a membranous socket at the base of the main portion of the aedeagus (this structure is typical for the genus).

Holotype, male, BEAR CREEK, CLATSOP COUNTY, OREGON, April 12, 1947, S. G. Jewett, Jr. (INHS).

OLIGOPHLEBODES Ulmer

Study of additional material of this genus has indicated the occurrence of interesting variations within certain species. In some cases this variation appears to be correlated with geographic distribution, on the basis of rather meagre collections at hand to date.

OLIGOPHLEBODES ARDIS Ross

An additional record of this species was obtained from Independence Pass, Colorado, Mt. Boy Park, 11,000 feet elevation, August 6, 1943, J. A. and H. H. Ross, 4♂ ♀. This distinctive species is the only one yet described in the genus in which the entire body is almost completely black.

OLIGOPHLEBODES SIGMA Milne

Dr. Knowlton has collected another record of this species from Cedar Breaks, Utah, 10,300 feet elevation, August 8, 1942, 3♂ ♀.

OLIGOPHLEBODES MINUTUS (Banks)

Available records indicate that this species is abundant in many mountain areas of Utah, Colorado, and Wyoming, and also in the Big Horn Mountains of Wyoming and the Black Hills of South Dakota. Material of *minutus* has been studied from the following localities: Colorado: Berthaud Pass (Swift Creek); Edloe (Alpine, 10,000′); Estes Park (Thompson River); Green Mt. Falls; Leadville; Rocky Mt. National Park (Cascade Lodge,

Chasm Falls, Hidden Valley Creek); Silver Plume; S. St. Vrain Creek (6 miles north of Ward, Boulder Co.). South Dakota: Hanna. Utah: Brigham Canyon; Currant Creek; Garden City; Logan Canyon (Rick's Spring, Spring Hollow, Tony Grove Camp); Mill Creek; Smithfield Canyon; Woodland. Wyoming: Big Horn Mts. (Shell Exit); Big Horn National Park (Bondi Camp, Tongue River); Fox Park; Wilson (Coal Creek).

OLIGOPHLEBODES SIERRA Ross

Some interesting material of this species, originally described from California, has been collected in Oregon and northern Wyoming. The Wyoming specimens differ from the California material (see Ross 1944, figs. 943 and 950) in having the apical tooth of the claspers more pronounced and sharper, figs. 7, 7*A*, and in having the lateral shoulder of the outer lobe of the subgenital plate much more pronounced, fig. 7*B*, occasionally even somewhat angulate. The Wyoming material was sufficiently constant that it seemed at first that it might represent a different species, but material from Oregon exhibited an almost perfect set of intergrades between the two extremes. In contrast with *minutus*, which has the wings definitely checkered with tawny and dark brown, *sierra* has the wings almost evenly yellowish brown, as is also the body. The light body will usually serve to differentiate it from *ruthae*, with which it has been taken.

Additional records of this species are as follows: California: Sequoia National Park (7,000 - 9,000′), June 23, 1929, E. C. Van Dyke, 3 ♂; Tulare County (Mineral King), August 4, 1923, C. L. Fox, ♂. Oregon: Mt. Hood (Horsethief Meadows) July 18, 1947, K. M. Fender, ♀ (Zigzag River) June 15, 1947, S. G. Jewett, ♂ ♀. Wyoming: Yellowstone National Park (Specimen Creek, Stations 1 and 2) August 6, 1947, J. A. and H. H. Ross, 22 ♂ ♀.

OLIGOPHLEBODES RUTHAE Ross

Since its original description considerable material of this species has come to hand. Some slight variation is exhibited by the claspers and also the height of the outer lobes of the genital plate. The claspers, however, are always elongate and slender, radically different from those of any other species of the genus.

Additional records include the following: Alberta: Laggan, July 10, 1925, O. Bryant, ♂. Montana: Glacier National Park,

(Many Glaciers C. G., Stream 2), July 12, 1940, J. A. and H. H. Ross, L.; Silver Gate (Soda Butte Creek), August 2, 1940, T. H. Frison, ♂. Oregon: Mt. Hood National Park (Government Camp, 4,000′), July 23, 1946, H. H. Ross, 8♂, 15♀. Wyoming: Wilson, (Coal Creek), August 12, 1940, T. H. Frison, 13♂, 2♀; Yellowstone National Park, (Dunraven Pass, Mt. Washburn), August 2, 1940, T. H. Frison, 2♀, (Specimen Creek, Stations 1, 2, 4, and 7; and small brook, Station 5), August 6 and 9, 1947, J. A. and H. H. Ross, 42♂ ♀.

The species is an abundant one in the northern part of the Rocky Mountain range, and early records indicated that it might be restricted to this area. The Oregon record shows, however, that its range extends westward at least into the Cascade Mountains, although it is apparently not abundant there.

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A NEW HOST RECORD FOR LEPTIDIELLA BREVIPENNIS (MULS.)

(Coleoptera, Cerambycidae)

During April, 1949, nineteen specimens of the longicorn beetle, *Leptidiella brevipennis* (Mulsant), emerged from several dead twigs of a mission fig. The infestation was confined to a backyard tree and was severe enough to be quite noticeable. This insect has not previously been reported from fig trees.

Identification of these specimens was confirmed by Dr. E. Gorton Linsley who first reported it from California (Linsley, 1933, Pan-Pac. Ent., 9:170). This insect is thought to be of southern European origin.

Dr. Linsley has subsequently reared this species several times from shaded twigs of Persian walnut as far north as Sacramento.

—Woodrow Middlekauff and Jack Underhill.

THE SPECIES OF DIANTHIDIUM OF BAJA CALIFORNIA[1]

(Hymenoptera, Megachilidae)

BY P. H. TIMBERLAKE
University of California Citrus Experiment Station, Riverside, California

In 1923, Cockerell described two new species of *Dianthidium* from Baja California. Recently, I received a small collection of *Dianthidium* collected by Ross and Bohart in that region, by means of which I am able to add two other species to the list.

DIANTHIDIUM PLATYURUM PLATYURUM Ckll.

Two males, 15 miles north of San Ignacio, September 29, 1941.

This species is represented in California by the races *baculifrons* Ckll. and *mohavense* Timb.

DIANTHIDIUM PARVUM PROFUGUM Ckll.

One male, 20 miles north of Mesquital, September 27, 1941.

On comparing this male with a cotype female from Puerto Refugio, Angel de la Guarda Island, May 1, 1921 (Van Duzee), I find close agreement. In my review (1943) of the North American species of *Dianthidium*, I placed *profugum* in a couplet with *parvum*, with the intent of distinguishing the two on the basis of a slight difference in the puncturation. This difference is so slight, however, that nobody, I am sure, could make a distinction on this basis. Moreover, the male now at hand shows that *profugum* is merely a race of *D. parvum* (Cress.).

In my key to the races of *parvum* (1943, pp. 95-96), *profugum* agrees best with the typical form. The female differs in having a very small spot on the mesopleuron, two small spots on the sixth tergite, and the maculations of the legs more extensive, as follows: stripe on front and middle femora beneath well developed, stripe on front and middle tibiae complete, but that on hind tibiae broadly interrupted by black at middle except for a narrow, connecting, pale line along posterior margin. From *D. parvum schwarzi* Timb., it differs in having the maculations paler and considerably less extensive.

[1]Paper No. 598, University of California Citrus Experiment Station, Riverside, California.

The male agrees closely with typical *parvum*. There are no stripes on the femora beneath, but merely a pale-yellow spot at apex of each femur above. A pale-yellow stripe is present on outer side of front and middle tibiae; on the hind pair only the basal fourth and a small spot at apex are yellow. The pale-yellow bands on tergites 1 to 5 are broadly and deeply excavated behind on each side, that on tergite 1 being in this manner divided into three spots, and those on tergites 3 to 5 being very narrowly interrupted medially. Tergite 6 has a very small yellow spot subapically in middle, whereas tergite 7 is entirely yellow, as usual.

Actually, therefore, *profugum* is weakly distinguishable from typical *parvum*, but as its population is isolated and probably has no connection with *parvum* except through the subspecies *schwarzi*, it may stand as a good race.

Dianthidium pudicum peninsulare Timberlake, new subspecies

This form resembles *D. pudicum consimile* (Ashm.) but the yellow maculations are paler and less extensive.

Male—Maculations moderately pale yellow, those of head and thorax becoming whiter than elsewhere, as usual. Supraclypeal mark, and mark on mesopleuron, small or absent. Stripe on front and middle femora narrow, and the yellow on hind tibiae confined to base and apex. Yellow bands of abdomen narrow in comparison with *consimile*, interrupted medially on tergites 2 to 5, and with a broad, rather deep emargination on each side behind, these emarginations almost or quite breaking through on tergite 1 and sometimes on 2. On tergites 4 and 5, the inner end of each half of the interrupted band is not distinctly broader than the outer end as it generally is in *consimile*. Length, about 7 mm.; anterior wing, 6 mm.

Described from three males from BAJA CALIFORNIA (Ross and Bohart): one, 20 miles north of COMONDU, October 3, 1941 (*holotype*, No. 6122, Calif. Acad. Sci., Ent.); another, 20 miles north of Mesquital, September 27, 1941 (paratype); and the third, Cataviña, September 25, 1941 (paratype).

The male from Cataviña has the maculations nearly as bright yellow as in *consimile*, and the hind tibiae yellow on outer surface, except for a small blackish spot on anterior margin beyond the middle. An occasional male of *consimile* from southern California approaches these males from Baja California, except that the abdominal bands are broader, less emarginate, and less interrupted.

Dianthidium rossi Timberlake, new species

This form is closely allied to *D. discors* Timb., recently described from western Texas. The puncturation of the mesoscutum is twofold as in *discors*, but the coarser punctures are smaller and considerably sparser than they are in that species. In other respects the two forms are similar and may ultimately prove to be races of one species.

Female—Black, becoming dark ferruginous on tegulae, on extreme apex of femora above, and on the claw joints of tarsi. Mandibles slightly rufous at apex. Markings pale yellow, with the pattern nearly as in *discors*. Tegulae with a yellow streak on outer side, margined exteriorly with pale testaceous. Lateral marks of face broad below and extending narrowly above almost to summit of eyes. Streak behind each eye reduced to a small oval spot. Thoracic markings as in *discors*, except that the spots on anterior margin of mesoscutum are a little larger and extend from the impressed line on each side about two thirds of the way to the outer margin. Maculation of abdomen as in *discors*, except that the marks are smaller, especially the submedian marks on tergites 3 to 5, which are consequently more widely separated from each other. The two marks on tergite 5, small and roundish and similar to the lateral spots on tergite 4. Mandibles slightly narrower at apex than in *discors*, the cutting edge oblique, with no trace of a preapical notch. The very coarse punctures of frons slightly more separated than in *discors*. A rather prominent, punctureless, blister-like swelling present between the lateral and anterior ocelli on each side (similar but smaller swellings present also in *discors*). Mesoscutum duller than in *discors*, with very fine almost contiguous punctures and large widely spaced punctures. The small punctures become finer and very dense on the anterior middle. Scutellum shining, closely and strongly punctured, the punctures not all of one size but the smaller ones coarser than the fine punctures of mesoscutum. Pubescence extremely short and fine on mesoscutum, becoming most conspicuous behind the bases of the wings. Ventral scopa whitish. Wings subfuliginous, darker in the marginal cell, the nervures dark. Length, 7 mm.; anterior wing, 6 mm.

Male—Similar to the female in sculpture and markings. In addition to the markings of the female, the head has the clypeus, except apical margin, and the mandibles, except apex, yellow. Bands of abdomen considerably broader than in female and less broken into spots. The two median spots on tergite 2 generally confluent, forming three marks as on tergite 1. The bands on tergites 3 and 4 generally narrowly interrupted medially and broadly and deeply emarginate behind on each side (that on 4 sometimes broken into four spots). Tergite 5 with four small, or comparatively small, spots, the outer ones far to the sides. Tergite 7 yellow, except at base. A stripe on front and middle tibiae (some-

times extending almost to apex on middle pair but generally only to the vicinity of the middle), a mark at base of hind tibiae and a small spot (sometimes obsolete) at apex, and stripe on outer side of hind basitarsi, pale yellow. Spurs of hind coxae yellow, conical, and of the usual length in this genus. Apical corners of tergite 2 (and those of following segments successively less) flaring and appearing inflated, but the inflation not involving the whole lateral margin of the segment as in *D. singulare* and *D. cressoni*. Tergite 7 trilobed at apex, the median lobe short, a little broader than long, bluntly rounded at apex, and ending in alignment with the tips of the lateral lobes as seen from above. Lateral lobes almost square at outer corners, oblique within and thus appearing strongly divergent. Aedeagus most similar to that of *D. platyurum*, but smaller, with the dilated apical part of the stipital parameres more slender and recurved outward instead of upward. Sagittae of the same general shape and convexity above as in *platyurum*, but gradually tapering from the broad base nearly to the apex, then more rapidly, so that each component ends in a short, very fine sharp point. Apical part of sagittae with fine short pubescence on each side, quite different from the conspicuous fringe in *platyurum*. Pubescence as in female, that of the venter sparse in comparison with most of the other species. Length, 8-9 mm.; anterior wing, 7 mm.

Two females, four males (holotype female, allotype, and paratypes), CATAVIÑA, BAJA CALIFORNIA, September 25, 1941 (Ross and Bohart), types No. 6123 and 6124, Calif. Acad. Sci., Ent.

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A NEW SPECIES OF STENELMIS FROM NEVADA
(Coleoptera, Elmidae)

BY HARRY P. CHANDLER
California Division of Fish and Game, Red Bluff, Calif.

Stenelmis calida Chandler, new species

Type, male. *Size.* Length 3.3 mm; width 1.23 mm.

Form and color. Body elongate, sides parallel. Elytra dark brown; rest of body covered with dense matted greenish gray pile except tip of last abdominal segment, tarsi, mouth parts, antennae, and part of head.

Head. Vertex with a dark median band, lateral gray bands slightly narrower; palpi and antennae yellow testaceous. Antennae shorter (7/8) than pronotum.

Pronotum. (Fig. 1, a). Length 1.1 mm.; width 1.0 mm., width at anterior margin .8 mm., at posterior margin .9 mm., widest posterior third, lateral margin concave in outline in front of widest portion and slightly so behind. Median sulcus moderately deep. A deep pit on either side just in front of scutellum. Lateral tubercles conspicuous, located at the anterior 4/9 and the posterior 2/7, the posterior pair more widely separated with a depression between them and the sulcus.

Elytra. Length 2.4 mm., width 1.23 mm. Entirely immaculate. First stria complete from base to apex. Carina between second and third striae strongly and widely elevated at base. Carina between fifth and sixth striae with inner side declivous and outer side beveled, extending from base to posterior 1/7. Distance between outer carinae narrowed from base to anterior third then parallel almost to posterior end. Elytral punctures deeply impressed.

Venter. Apical emargination of last abdominal segment about equal to width of base of last tarsal segment.

Legs. Color rufous, all except tarsi covered with grey pile. Tibia length: hind 1.24 mm., middle 1.15 mm., front 1.02 mm. Last tarsal segment of the front and middle legs about 1/15 longer than the basal four segments combined. Last segment of metatarsus nearly equal to basal four segments. Last tarsal segment is more strongly enlarged beyond the middle, claws long and comparatively slender. Middle tibiae with a swelling on inner margin near middle as is characteristic of the males of this genus.

Allotype, female. Length 3.2 mm.; width 1.2 mm. Color and form similar to type except for sexual difference of the middle tibia which is without the enlargement.

Disposition of types. Holotype, allotype and *paratypes* collected by Ira La Rivers on December 31, 1946, will be placed in the collection of the California Academy of Sciences; paratypes in the collections of Mr. La Rivers, Dr. Milton Sanderson, Museum of Comparative Zoology at Harvard, U. S. National Museum, Washington, D. C., British Museum, Dr. Paul N. Musgrave and the collection of the author.

Comparisons. This species ranges in length from 3.0 to 3.4. The metathorasic wings of both sexes are reduced and non functional. They reach only to a point even with the middle of the third abdominal segment, apical third almost completely lacking so that the wing is truncate at apex. This species does not distinctly run to either the *humerosa-sinuata* group or the *crenata* group as delimited by Sanderson[1] in his key. The last tarsal segment of the front and middle legs are longer than the other tarsal segments combined, but those of the hind legs are equal. The last tarsal segment is noticeably more strongly enlarged beyond the middle, but the claws are comparatively slender. In the *humerosa-sinuata* group it will run to *S. fuscata* Blatchley in Sanderson's key. It may easily be separated from this by the prominent elevation of the interval between the base of the second and third stria of the elytra. In the *crenata* group it is separated at once by the absence of maculations on the elytra. The resemblance to the more immaculate specimens of *S. crenata* is quite close; however, there are many small differences such as the stronger enlargement of the distal half of the last tarsal segment and the reduction of the wings in *S. calida.*

Larva. The larva conforms in general with the description by West[2] of an unknown species of *Stenelmis* which he designates as Type 4. The more obvious differences are described as follows: The prothorax is nearly three times as long as the succeeding segments, the widest point being at the posterior third. Posterior abdominal segment subconical, (Fig. 1, b) slightly more narrowed at apex. Apex truncate with a short spine at marginal angles. The ventral operculum 1/3 as long as the segment. Antennae two segmented without trace of a third segment in the single specimen

[1]Sanderson, Milton W., 1938. A monographic revision of the North American Species of *Stenelmis* (Dryopidae: Coleoptera) Bull. Uni. Kan., Vol. XXXIX, 685-717.

[2]West, Luther S., 1929. A preliminary study of larval structure in the Dryopidae, Ann. Ent. Soc. Amer., Vol. XXII, p. 697.

examined. The second segment is about half as wide and one third longer than the first. The ocelli are located some distance

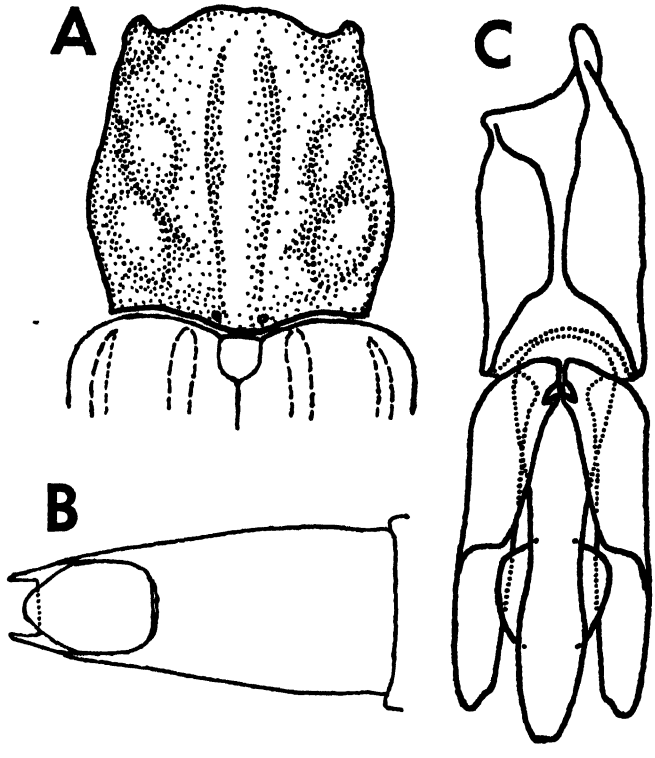


Fig. 1. *Stenelmis calida* Chandler. A. Pronotum. B. Ventral view of last abdominal segment, larva. C. Male genitalia.

below the cuticle, and the cuticle tubercles and spines are uniformly distributed over this portion of the head which may indicate that semi cave life has caused the ocelli to be less functional. Labrum evenly rounded anteriorly.

Distribution. While checking aquatic beetles in the collection of Ira La Rivers, the author discovered under another genus three specimens of *Stenelmis* from Devil's Hole, Nye County, Nevada, elevation 2,500, collected by A. W. Vanderhorst September 11,

1941, which were obviously new records for the state. As Mr. La Rivers was desirous of recording all the species occurring in the state, the specimens were carefully studied and found to be undescribed. On December 31, 1946, Mr. La Rivers visited this location and succeeded in securing a large series of adults and one larva. It was learned in correspondence with Dr. Sanderson of the Ill. Nat. Hist. Survey that he had half of a small series (10 specimens) from the same locality collected by A. R. Miller on January 9, 1939, which had never been critically studied. The other half of the series remained in the Museum of Comparative Zoology Collection. These were obtained on loan and form part of the paratypes.

Devil's Hole is located thirty miles east of Death Valley at the base of a low range of mountains on the east side of Ash Meadows in Nye County, Nevada. According to Mr. La Rivers it is a warm spring pool located at the bottom of a crevice or crater, possibly a part of a water formed cave. The crevice at the water surface is about 10 feet wide by 65 feet long. The surface of the water is 50 to 60 feet below the lowest part of the rim. There is no apparent inlet or outlet. Water marks on the walls indicate that water has stood for some time at depths of 10 to 15 feet above the present surface level. The temperature of the water never varies more than one degree from 92° Fahrenheit winter or summer. Mr. La Rivers could not find *Stenelmis* in any of the nearby streams or warm springs. Also confined to this warm spring is a small (about 20 mm.) minnow, *Cyprinodon diabolus* Wales. Both of these species may have been isolated in this warm spring since the subsidence of a prehistoric lake which covered this site probably in the early Pleistocene.[3] With the exception of *S. nubifer* Fall which occurs along the Pacific states but is not closely related to the other *Stenelmis*, this is the farthest west that this genus has been recorded. Another extension of this genus to the west was the collecting of *S. bicarinata* Lec. at Loving, New Mexico, August 5, 1945, by Mr. J. W. MacSwain.

[3]Miller, Robert R., 1948. The Cyprinodont fishes of the Death Valley system of Eastern California and Southwestern Nevada. Misc. Pub. Mus. of Zoo., Uni. of Mich., No. 68, April 20, 1948, pp. 85-86.

NOTES ON CERAMBYCIDAE FROM THE LOWER RIO GRANDE VALLEY, TEXAS[1]

(Coleoptera)

BY GEORGE B. VOGT

University of Maryland, College Park

This paper is the fourth of a series based upon the collections made by the writer in the Lower Rio Grande Valley, Texas, during 1946 and 1947. In the annotated list that follows eighty-three species of the longhorns are given with biological notes, and in case of one species (*Leptostylus gibbulosus* Bates) apparent synonymy is brought to light.

Preparation of this paper has been aided by the encouragement and assistance of Dr. E. Gorton Linsley, Mr. W. S. Fisher, Dr. W. H. Anderson, and Dr. J. N. Knull, and the writer expresses his sincere gratitude to these workers. Determinations here treated were greatly facilitated and materially authoritated by the writer's access to the United States National Museum Collections, and to the officials at this institution the writer extends his most sincere thanks. Both Mr. L. L. Buchannan and Dr. E. A. Chapin have been especially cooperative in providing working space and facilities. And the commendable librarial assistance of Miss Mathilde M. Carpenter is gratefully acknowledged.

The localities referred to in this paper are accurately shown on the accompanying map. Unnamed localities are designated by numbers which in the text appear within quotation marks. Floral associations and topography of the localities have been treated elsewhere.[2]

[1]Scientific article No. A221. Contribution No. 2144 of the Maryland Agricultural Experiment Station (Department of Entomology).

[2]Vogt, A Biologically Annotated List of the Buprestidae of the Lower Rio Grande Valley, Texas. Ann. Ent. Soc. Amer. (In press.)

The common names of the plants listed below occur frequently enough in the text to warrant giving their scientific equivalents here:

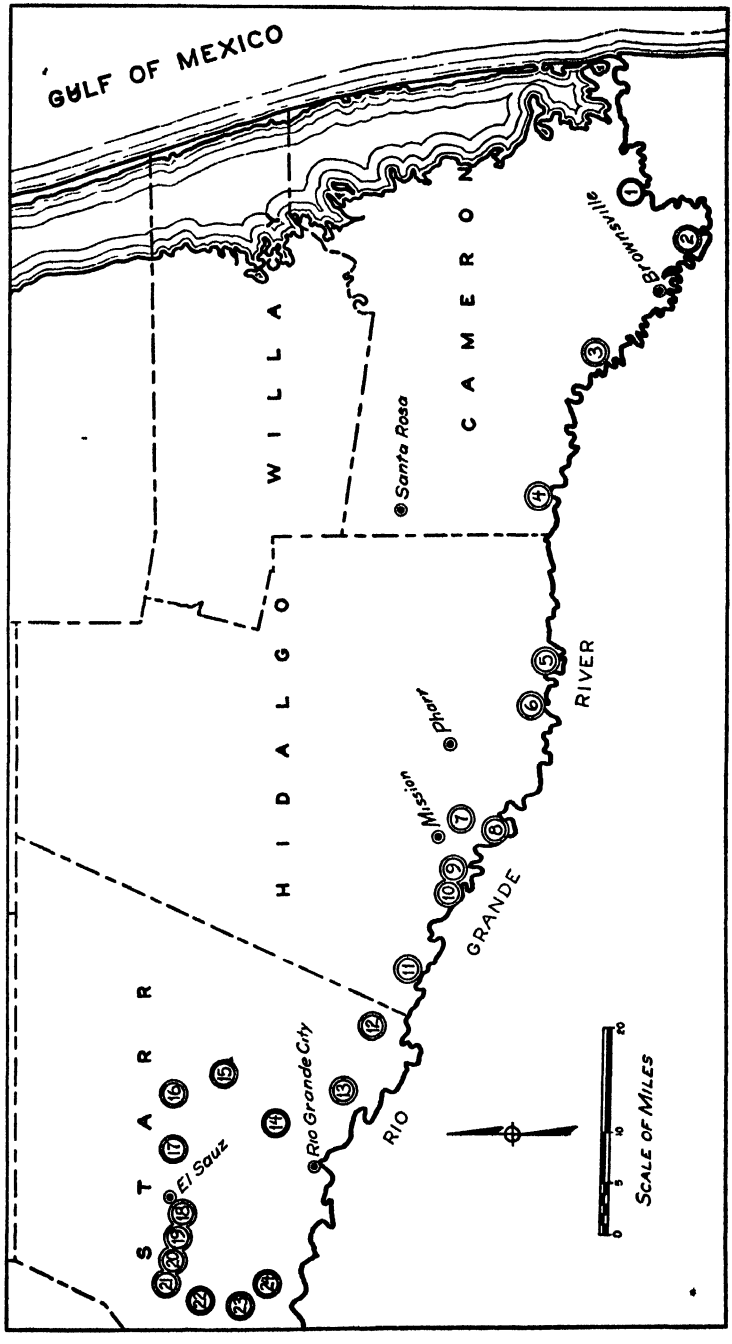
Brasil .....*Condalia obovata* Hook.
Cedar Elm .....*Ulmus crassifolia* Nutt.
Coma .....*Bumelia celastrina* H. B. K.
Coyotillo ....*Karwinskia Humboldtiana* (R. & S.) Zucc.
Ebony .....*Pithecolobium flexicaule* (Benth.) Coulter
Giant Opuntia .....*Opuntia Lindheimeri* Engelm.
Goldenrod .....*Solidagio canadensis canescens* Gray.
Guajillo .....*Acacia Berlandieri* Benth.
Hackberry .....*Celtis laevigata* Wild.
Huisache .....*Acacia farnesiana* (L.) Willd.
Lote .....*Condalia obtusifolia* (Hook.) Weberb.
Mesquite .....*Prosopis juliflora* (Swartz) DeCandolle
Retama .....*Parkinsonia aculeata* L.
Soapberry .....*Sapindus Drummondii* H. & A.
Sunflower .....*Helianthus* sp.
Tepehuaje ....*Leucaenia pulverulenta* (Schlect) Benth.
Willow .....*Salix* sp.
Yellow top .....*Verbesina encelioides* (Cav.) Benth. and Hook.
Yucca .. ..*Yucca treculeana* Carr.

1. STENODONTES DASYSTOMUS Say

Rather common under bark of dead hackberry and occasionally willow at "8" and "10" during April, May, June, September and November; numerous emergence holes in dead trunk wood of these trees. Also a few specimens at light in Pharr and Rio Grande City.

2. DEROBRACHUS GEMINATUS Lec.

Six males at light in Rio Grande City during May and a dead female measuring over seventy millimeters was found at "9" on June 14. During May and June in the dry uplands north of the Rio Grande City, these beetles take to wing at dusk and are commonly seen against the horizon, but their pursuit is impossible unless one tangles with the spiny cactus and chapparal. An aberrant record was made at Pharr, when a single male was taken at light on August 7, 1947.


GULF OF MEXICO
CAMERON
WILLACY
HIDALGO
STARR
Brownsville
Santa Rosa
Pharr
Mission
Rio Grande City
El Sauz
RIO GRANDE RIVER
SCALE OF MILES
0
5
10
20

3. SMODICUM CUCUJIFORME Say

Two specimens under the bark of dead hackberry at "10" on April 14, 1946.

4. MALACOPTERUS TENELLUS Fab.

Occasionally under bark of dead hackberry at "10" during March and again in October.

5. STYLOXUS sp.

Three specimens at lights in Pharr, July 6 and August 4-15, 1947. These are not *S. fulleri* Horn or *S. texanus* Schffr.

6. ACHRYSON CONCOLOR Lec.

Frequent at lights in Pharr, May, July, and August. Also at light at "11" on September 20, 1947. Reared in July from dead cedar elm limbs collected at "10" during June. Also collected during December in huisache branches that had been pruned by *Oncideres pustulatus* Lec. Determined by Linsley.

7. ACHRYSON SURINAMUM (L.)

Numerous records under bark of recently killed hackberry, cedar elm, and mesquite at "9" and "10" during March, April and May. Also at lights in Pharr during March, April, May, and August.

8. GNAPHALODES TRACHYDEROIDES Thoms.

On fresh cut huisache, ebony, and mesquite at "4" and "6" during May and June, 1946. At lights in Pharr, May through September. And a single specimen inside a store window at Pharr on January 8, 1946.

9. CHION CINCTUS Drury

Two reared in July from soapberry branches from "8" which had been cut five months before they were caged on April 30, 1947. On February 8, 1946, one was taken on fresh cut willow and on June 1-10 and October 11, 1946, three were collected at light in Pharr.

10. PANTOMALLUS OVICOLLIS Lec.

Taken at lights in Pharr May through September.

11. EBURIA STIGMATICA Chev.

Frequent under bark of dead hackberry at "10" March through July and October. Also under bark of dead willow at "8."

12. EBURIA HALDEMANI Lec.

A single specimen under bark of a cedar elm log at "10" on May 18, 1946.

13. EBURIA MUTICA Lec.

Common at lights in Pharr, April, May, June, and September. Also two from lights in Rio Grande City on May 24, 1947. And several under loose bark of hackberry logs at "10."

14. EUSTROMULA VALIDUM Lec.

A single specimen at light near "24" on May 24, 1947.

15. ELAPHIDION INCERTUM Newn.

Two from under bark of dead willow at "10" on June 30, 1946. Two additional specimens at lights in Pharr during September, 1947.

16. ELAPHIDION COMPACTUM Casey

Five specimens at light in Pharr during May and July.

17. ELAPHIDION MIMETICUM Schffr.

Four from under loose bark of dead willow at "8," May 14-24, 1946. Also at light in Pharr during May and June.

18. ANEPYSYRA TENUE (Lec.)

Two specimens at light at "11" on August 9, 1947.

19. ANEFLUS SONORANUS Casey

A single specimen from decadent lote at "20" on June 14, 1947.

20. ANEFLUS PROTENSUS Lec.

Three specimens on dead branches of decadent mesquite at "14" and "20," June 14 - July 4, 1947.

21. ANOPLIUM MOESTUM Lec.

At light in Pharr during June, July and August. Also under bark of hackberry at "10" on July 14, 1946, and on fire killed Opuntia at "4" on June 16, 1946.

22. ANELAPHUS (probably *truncatus* (Hald.)

A single record at light in Rio Grande City on May 24, 1947.

23. PSYRASSA SALLEI Bates

One specimen beaten from soapberry coppice at "8" on September 1, 1947. Determined by Linsley.

24. PSYRASSA BREVICORNIS Linsley

Four specimens at light at "11," August 9, 1947. Determined by Linsley.

25. COMPSA PUNCTICOLLIS Lec.

A single specimen at light, Pharr, August 4-15, 1947. Determined by Linsley.

26. HETERACHTHES NOBILUS Lec.

Eight specimens at lights in Pharr April through July, again in August.

27. IBIDION EXCLAMATIONIS Thoms.

Under bark of dead *Pithecolobium pallens* (Benth.) Cory and on fresh cut ebony at "4" during June. Also, at lights in Pharr during May, June, and August.

28. OBRIUM MACULATUM Oliv.

Three reared from the same soapberry branches as Number 9, emerging on June 2 and June 25, 1947, and several emerged during late April, 1946, from the Oncideres-pruned tepehuaje branch described under 76. At lights in Pharr during May and again during August and September.

29. OBRIUM MOZINNAE Linell

Two specimens beaten from flowers and foliage of brasil on June 8, 1946 at "4."

30. OPHISTOMIS LAEVICOLLIS Bates

Five specimens on flowers of Coma at "9" on October 27, 1946.

31. LEPTURA GIGAS Lec.

Two specimens in flight, one in Donna, on May 20, 1946, and the other near willow tree at "8" on April 7, 1946. Two others were seen during May, 1947, at "8" flying about willow trees, high out of reach. Remains of unsuccessful adults have been exposed by chopping into rotten willow logs, being good evidence that their larvae bore in dead willow.

32. CALLICHROMA SCHWARTZI Fisher

Frequent on flowers of lote and *Cissus incisa* (Nutt.) Des Moulins at "6," "19," "22" and "23" April 24 through May 31. When disturbed this beautiful cerambycid emits a milky white volatile material having a fragrance similar to butyraldehyde.

33. CALLIDIUM TEXANUM Schffr.

Two specimens, from Pharr and McAllen, March 3 and 7, 1947. Both were on cedar fence posts which had been imported from northern parts of Texas.

34. PLACOSTERNUS DIFFICILIS Chev.

One of the most common Cerambycids of the area. Numerous on fresh cut mesquite at "6" and "9" during May and October and November, often in company with *Megacyllene caryae* during the fall. Frequent on fresh cut ebony at "4" during May, 1946. Swarming over fresh cut hackberry at dusk at "10" on April 7, 1946. Early in March often seen about waste citrus dumps near Pharr. At flowers of *Koeberlinia spinosa* Zucc. and guajillo at "6" during March. One emerged on September 23, 1946, from the same mesquite log described below under 35. Several also reared from a Huisache branch, which had been pruned by *Oncideres pustulatus*, emergence taking place on March 17 and May 9, 1946.

35. MEGACYLLENE CARYAE Gahan

Frequent on fresh cut mesquite in a clearing at "9" during October. Eight emerged on September 23-25, 1946, from a mesquite log which had been cut ten months previously at "4" but

not caged until August, 1946. It is interesting to compare the seasonal occurrence of this species at this locality and in the East where it is distinctly an early spring form.

36. NEOCLYTUS MUCRONATUS (Fab.)

Collected in numbers on fresh cut hackberry at "10" during March, July and October. Adults cut from old hackberry logs at "10," March 9 through June 30, 1946. Eight emerged early in July from dead cedar elm limbs collected at "10" on June 31, 1946. Common on decadent retama at "7" on June 14, 1946, and frequently observed on this host thereafter. This cerambycid was the only insect observed affecting retama except for the Bostrychids, which are impartial borers in dead wood.

37. NEOCLYTUS ACUMINATUS HESPERUS Linsley

Three collected on fresh cut *Pithecolobium pallens* (Benth.) Cory at "2" on August 31, 1946.

38. NEOCLYTUS ABBREVIATUS Schffr.

During April, 1946, five were collected from weakened *Baccharis neglecta* Nutt. six miles southwest of Pharr. A week before, also observed on fresh cut branches of the same host at "9." A single specimen emerged on June 2, 1947, from dead soapberry branches collected at "10."

39. TETRANODUS NIVEICOLLIS Linell

A single female swept from a weedy tomato field adjacent to Palm Grove at "2" on May 25, 1946.

40. EUDERCES EXILIS Casey

Frequent beating mesquite, brasil, soapberry, huisache and huisachillo (*Acacia tortuosa* (L.) (Willd.) at "4," "8" and "9" during March, April and June. Two emerged June 2, 1947, from dead soapberry branch collected at "10."

41. RHOPALOPHORA LAEVICOLLIS Lec.

Four specimens on fresh cut ebony and one on fresh cut mesquite at "4" on May 26 and June 2, 1946. Also on fresh cut mesquite at "9" on October 13, 1946, and on brasil at "4" on June 8, 1947. One specimen on flowers of *Baccharis neglecta* Nutt. at "2" on September 30, 1946.

(continued)

The Pan-Pacific Entomologist

VOL. XXV, No. 4 October, 1949

THE IDENTITY OF *HEMITRIOZA WASHINGTONIA* KLYVER AND *APHALARA PUNCTELLUS* VAN DUZEE

(Homoptera: Psyllidae)

By D. D. Jensen
University of California, Berkeley

Klyver (1930) described as *Hemitrioza washingtonia* a single male psyllid collected at Toppenish, Washington. The writer has examined this specimen, mounted on a slide, in the collection of Stanford University. It proves to be a species of *Calophya* rather than *Hemitrioza* and is typical of the genus in all of its characters. It is readily distinguishable from *Hemitrioza* by the very large and conspicuous pterostigma, by other venational characters and by the very short antennae. *Hemitrioza sonchi* Crawf. still remains the only species known in that genus.

Of the previously described species of *Calophya, C. washingtonia* is most closely related to *C. nigripennis* (Riley). The bright yellow thorax and genal processes of *nigripennis,* however, serve to distinguish it readily from *washingtonia* which, according to Klyver, is uniform medium brown over the entire body. A species closely related to *washingtonia* has been collected by the writer in southern California and will be described in a later paper.

Van Duzee (1923) described as new, three species of psyllids (*Aphalara mera, A. punctellus, and A. nupera*) collected by the Expedition of the California Academy of Sciences to the Gulf of California. The writer (1945) reported that the species described as *A. mera* is *Heteropsylla texana* Crawford.

Recent examination of the other two species described by Van Duzee revealed that *nupera* was placed correctly in *Aphalara* where it resembles *A. pulchella* Crawford, and that *punctellus* is a synonym of *Aphalaroida inermis* Crawford.

The following comments are given to supplement the descriptions published for this species by Crawford and by Van Duzee. The body does not have conspicuous glandular hairs except on the distal portions of the vertex and a few on the pleuron in front of the wings. The proctiger of the male genitalia is 0.34 mm.

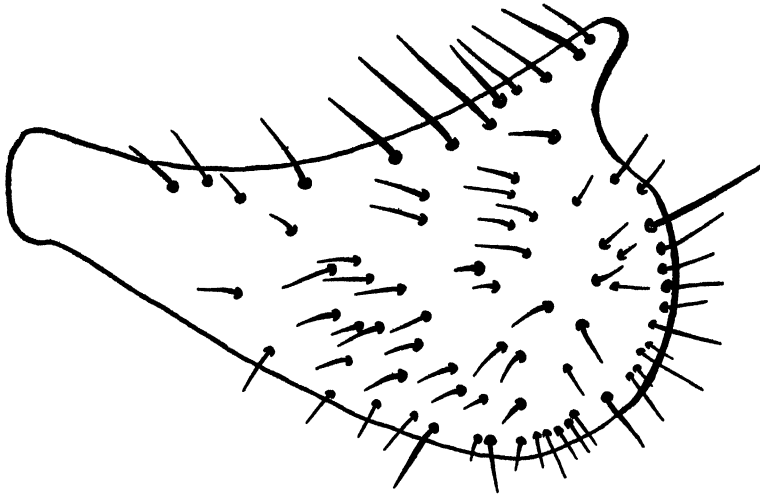


Fig. 1. *Aphalaroida inermis* Crawford. Inner surface of male forcep.

long, simple, straight, with the margins converging slightly toward the rounded apex. Most of the basal two-thirds of the anterior face of the proctiger is bare. The distal portion is covered with short but dense pubescence. The forceps are approximately one-half as long as the proctiger and somewhat pyriform in lateral view (Fig. 1), the caudal margin being convexly rounded and the cephalic margin concave in outline. The apex is broadly rounded except for the anterior portion which is produced cephalad and slightly mesad as a thumb-like lobe. The medial portion of the apex bears a narrow, medially produced flange on the inner face. Setae are sparse on the outer surface, but common and conspicuous on the mesal face of the forceps, the largest arising primarily near the cephalic margin.

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SUBSPECIFIC NAMES FOR TWO COMMON PACIFIC COAST ANDRENA

(Hymenoptera: Andrenidae)

BY URLESS N. LANHAM
Department of Zoology, University of Michigan

Collectors on the Pacific Coast have long recognized that the representative of *Andrena cressonii* Robertson found there differed from the typical form, the almost complete lack of tergal hair bands in both sexes giving it an appearance very different from that of the eastern *cressonii*. Several names have been applied to *A. cressonii*, but none of these can be used as a subspecific name for the far western form. The type localities of these are from the Rocky Mountains eastward, and, although two (*bridwelli* Cockerell and *dubia* Robertson) represent variations which have face markings in the male approaching the condition which is normal in the Pacific Coast form, the characteristically infasciate condition of the terga of the latter is not found in unworn eastern specimens.

Andrena cressonii infasciata Lanham, new subspecies

Female. Like typical *cressonii*, but differing in the following details: only short lateral patches of hair present on terga 2-4, although 4 with a very sparse band of hair medially; clypeus duller, more coarsely reticulate, punctures near middle more closely crowded.

Length, approximately 10 mm.; anterior wing, 8.5 mm.

Male. Terga without apical hair bands; sculpture of frons coarser than in typical *cressonii;* clypeus with entire apical margin black, lower margin of yellow not neatly defined at middle of clypeus as in typical *cressonii*, lateral yellow face marks not nearly reaching to bases of antennae, only about one-third as large as in typical *cressonii*.

Length, approximately 9 mm.; anterior wing 7 mm.

Holotype, female (Calif. Acad. Sci., Ent. No. 6132): 4 mi. N. W. ORINDA, CALIF., 27 March, 1948, *Brassica* (C. C. and U. N. Lanham). *Allotype, male* (Calif. Acad. Sci., Ent. No. 6133): same data as holotype. *Paratypes:* 3 females, 3 males, same data as holotype (except one male from *Salix*); Berkeley, Calif., 11 March, 1947, *Brassica*, 1 female (J. W. MacSwain), 27-30 March, 1948, 1 female, 8 males (P. D. Hurd, U. N. Lanham), 6 April, 1948, *Brassica*, 2 males, (P. D. H.), 16 May, 1948, *Pyracantha*,

1 female (P. D. H.); 8 mi. E. of Pinole, Calif., 23 March, 1947, swept from mixed *Brassica* and *Ranunculus*, 19 females, 6 males (P. D. Hurd, C. C. and U. N. Lanham); Saranap, Calif., 20 March, 1948, 1 female, 6 males (U. N. L.); Danville, Calif., 20 March, 1948, 14 males (U. N. L.). All of these localities are on the east side of San Francisco Bay; some are east of the Berkeley Hills. Additional specimens, not included in the paratype series, are from the following localities: Black's Mtn., Lassen Co., Calif., 13 June, 1941, 2 females (P. D. H.); Big Spring, Shasta Co., Calif., 23 May, 1941, 1 female; Yosemite Valley, Calif., 16 June, 1935, 1 female (E. G. Linsley). I have seen specimens referable to this subspecies from Riverside, California and Washington State; the extent of its range eastward is not known to me at present.

A. cressonii infasciata appears to be of somewhat larger average size than *cressonii* from Illinois. There is some variation in the development of the tergal bands, but the present subspecies almost never has the hair band on tergum 3 even approaching completeness, while it is usually complete in females of the typical form. The entire apical margin of the clypeus is black in all males of the paratype series of *A. c. infasciata*, and one male (not stylopized) lacks yellow face marks entirely; other specimens show intermediate degrees of loss of face markings. The rather uncommon eastern *A. dubia* Robertson and *A. bridwelli* Cockerell have the face with yellow markings similarly restricted (apical margin of clypeus black); since these names were based on male specimens, and no constantly differing females have been recognized in the eastern fauna, at present it seems best to regard these as synonyms of *cressonii* Robertson. Conclusive evidence of neither geographic races nor sibling species has yet been demonstrated in *cressonii* from the Rocky Mountains eastward. Because of the appreciable amount of convergent variability in the eastern and western forms, the lack of differences in the male genitalia, and the fact that they are apparently allopatric, *infasciata* is given only subspecific rank. *A. cressonii cressonii* has been seen from Boulder, Colorado, and the Atlantic Coast near Washington, D. C.; the type locality is Carlinville, Illinois.

Andrena osmioides benitonis Lanham, new subspecies

This is a dark form of *osmioides*, in which the hairs of the head are mostly black, instead of all white, as in the typical form.

Female. Like nominate *osmioides*, except for the following differences in coloration of the pubescence: hair of head dark brownish-black, except that hairs about bases of antennae are somewhat lighter, although dusky; some dusky hairs at sides of propodeum; hairs of all segments of front legs black, hind tibial scopa black.

Length, approximately 11 mm.; anterior wing, 9.5 mm.

Male. Appears to be exactly like nominate *osmioides*, except that there are a few dusky hairs at the extreme lateral margins of the face. Length, about 9.5 mm.; anterior wing, 7.5 mm.

Holotype, female (Calif. Acad. Sci., Ent. No. 6134): PINNACLES NATIONAL MONUMENT, SAN BENITO CO., CALIF., 24 April, 1948, *Cryptantha* (P. D. Hurd). *Allotype*, male (Calif. Acad. Sci., Ent. No. 6135): same data as holotype. *Paratypes:* 1 female, 2 males, same data as holotype; Pinnacles, Calif., 25 March, 1940, *Cryptantha,* 5 females (E. G. Linsley); Jamesburg, Monterey Co., Calif., 22 March, 1940, 16 females (E. G. Linsley). Additional specimens referable to this subspecies, but not included in the paratype series, are 18 females from San Antonio Valley, Santa Clara Co., Calif., 20 April, 1948 (Ray F. Smith).

This subspecies is a more northern representative of *osmioides,* the typical form having been described from Claremont, California. Numerous individuals from Riverside, California, all had the pubescence of the head entirely white. There is slight variation in coloration in the paratype series of *A. o. benitonis*, an occasional specimen having nearly white hairs on the front femora or having the scopal hairs more or less white. The series from San Antonio Valley, approximately 75 miles north of the type locality of *benitonis,* are uniformly with dark heads and legs, and perhaps have the lower pleural hairs darker than do the Pinnacles or Jamesburg specimens. Three specimens of *osmioides* seen from the region north of San Francisco Bay indicate that the form occupying that area may be one which continues the trend to dark coloration northward, since they had not only the hair of the head and legs, but also that of the pleura black. Very few specimens have been seen from the western foothills of the Sierras, on the eastern edge of the Central Valley, but a single female from Auburn, Placer Co., Calif., has only a few black hairs on the face, and the pubescence elsewhere has a strong reddish tinge; it is possible that another subspecies occupies this area.

I am indebted to the authorities in charge of the California Insect Survey collection at the University of California, Berkeley, for the loan of material; paratypes of the new subspecies are to be found in that collection.

A SOUTH AMERICAN SPECIES OF BUPRESTIDAE TAKEN IN CALIFORNIA

(Coleoptera)

BY W. J. CHAMBERLIN
Oregon State College, Corvallis

Among some beetles recently submitted for determination was a very striking specimen belonging to the genus *Chrysobothris*. Being quite familiar with practically all indigenous species belonging to this genus and being unable to recognize the species and finding that it did not fit into either Horn's or Fisher's key, the specimen was sent to Dr. E. C. Van Dyke. He reports the specimen to be *Chrysobothris amabilis* Lap. & Gory which is known from Brazil, Venezuela and Guiana in South America.

The species has not previously been reported from the United States and was probably introduced in wood from South America.

The specimen is labeled San Bernardino, California (Insectary) 23 December 1941. Ed Appel.

The species somewhat resembles C. *geminata* Lec. but is smaller (Length 16.5 mm.) clypeus faintly, broadly emarginate; thorax smooth, coppery green with coppery red triangular splotches at the humeri; elytra shining greenish blue with the fovea near the base deep, nearly circular and brilliant green, similar foveae more shallow and slightly larger near center of each elytron; posterior foveae divided into two brilliant green irregular spots. Elytra widest near the humeral angles with a green spot and coarsely serrate more than one-third from the tips which are separately prolonged into a spine; each elytron with one very evident costa extending from tip of elytron nearly one-half to base. Shining green beneath; tibia and extremities of femora coppery red. Last ventral (evidently a female) edges entire, neither interrupted nor serrate. A very evident narrow, high, keel, or carina extends from the margin to the base, less elevated near the latter. Posterior margin with deep serration somewhat similar to *C. aerea* Chev. (Horn, 1886, fig. 176).

REFERENCE

HORN G. H. 1886. A monograph of the species of Chrysobothris inhabiting the United States. Trans. Amer. Ent. Soc. 13:65-124, plates II-VII, figs. 1-247.

A NEW APHID ON LETTUCE

(Homoptera)

BY E. O. ESSIG
University of California, Berkeley

A yellowish-green aphid was collected in large numbers from the flowering stalks and seed heads of cultivated lettuce, *Lactuca sativa* L., at Parma, Idaho, September 25, 1947 and July 23, 1948, by Dr. H. C. Manis and Professor W. F. Barr of the University of Idaho, who furnished all of the specimens herein described. Dr. H. C. Manis reports that these may be the same as the unknown species of aphid which caused rather severe damage to seed lettuce in the Parma region in 1927. The 1949 infestation is considerably less than those of 1947 and 1948.

Since receiving these specimens reports of this same species have been received from Professor Miriam A. Palmer, who reported a heavy infestation on lettuce in her garden at Boulder, Colorado, in October, 1947. The Colorado specimens were compared with specimens collected in Idaho and are the same species.

Dr. F. C. Hottes has also reported receiving specimens of the same species from Dr. Herbert H. Ross, Illinois Natural History Survey, Urbana, Illinois, who collected them on lettuce in that state in July or September, 1948.

Macrosiphum barri Essig, new species

(Fig. 1)

Alate viviparous female. Type. Head, thorax, antennae, black excepting bases of IV, V, and VI, which are pale; tips of femora, tibiae, and all of the tarsi, black. Knobbed hairs on abdomen as illustrated. Antennae with 13-13 circular sensoria nearly in a straight line on segment III. Length of segments: III, 0.57 mm.; IV, 0.38 mm.; V, 0.33 mm.; VI, 0 61 mm.; (base 0 15 mm. - 0.46 mm.). Cornicles cylindrical, somewhat enlarged at base and apically; slightly reticulated and constricted near tip. Arrangement of spines on head, antennae, and genital plate; on the rostrum; and base of the hind leg as indicated in the enlarged drawing. Wings with veins slightly pigmented close to margins; radial sector sharply curved and not extending to tip of wing; 2nd fork of media about midway from base to tip of wing.

Apterous viviparous female. Paratype. Pale yellowish or greenish throughout; rather slender; with short, curved, knobbed hairs arranged in 6 rows on the dorsum and a marginal row on each

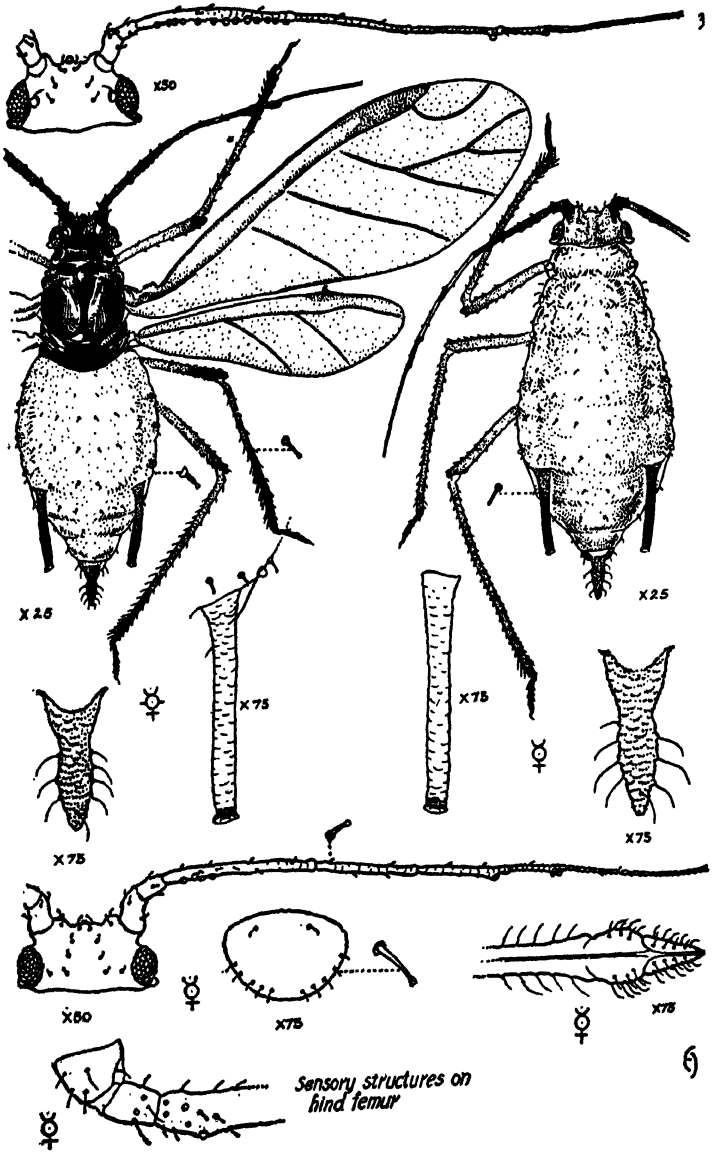

Fig. 1—*Macrosiphum barri* Essig. Alate and apterous viviparous females with details of heads, cornicles, setae, caudas, rostrum, anal plate, and base of hind leg of apterous female.

(Drawing by Frieda Abernathy).

side of the abdomen and a few also on the antennae. Antennal segments I, II, III, tips of IV and V, and all of VI; the cornicles, cauda, and tarsi dusky; lateral tubercles on prothorax and abdomen. Arrangement of spines and sensoria on head and antennae as shown in enlarged drawing. Segment III of antenna with 3 to 5 circular sensoria in a row on basal half (see Figure 1). Length of antennal segments: III, 0.54 mm.; IV, 0.34 mm.; V, 0.31 mm.; VI, 0.61 mm.; (base 0.15 mm. + unguis, 0.46 mm.). Cornicles nearly cylindrical, wide at bases, with flaring rim, somewhat reticulated near tips; length 0.46 mm. Cauda relatively slender, base swollen, tapering to a narrower median constriction, pointed; with about 8 hairs; length 0.32 mm.

Length of body 2 mm.

The type and 22 other alates and 22 apterae were studied and are preserved in diaphane on 15 glass microscopic slides. The type and certain paratypes are in the author's collection. Paratypes have also been presented to Professor Barr, University of Idaho, to the U. S. National Museum and to the California Academy of Sciences.

This species appears to be quite distinct from related species in this country and elsewhere.

From *Macrosiphum dirhodum* (Walker) it may be separated by the relatively shorter antennal segments, more secondary sensoria in the apterae and fewer in the alates and also by longer rostral hairs. It differs from *M. scariola* (Nevsky) (*Acyrthosiphon*) by the darker appendages and fewer sensoria in all forms and by the longer cauda.

Paratypes show considerable variation in the number of secondary sensoria in the alatae: from 11-17, and in the apterae: from 2-8. In the latter, the sensoria appear to divide into two as often shown by 3 on one side and 6 on the other.

A NEW SPECIES OF STIZOCERA FROM FLORIDA

(Coleoptera: Cerambycidae)

BY E. GORTON LINSLEY
University of California

Gounelle has broadened and redefined *Stizocera* Serville to include a number of species which differ from the genotype in having the pronotum more or less tuberculate laterally. The following is a *Stizocera* in the sense of Gounelle.

Stizocera floridana Linsley, new species

Female: Form elongate, narrow, subcylindrical, slightly flattened above; surface polished, pale rufo-testaceous, elytra testaceous, eyes black. Head very sparsely punctate, nearly glabrous, a fine longitudinal groove between antennal tubercles; antennae extending a little more than two segments beyond apex of elytra, segments three to eight or nine finely, longitudinally carinate, three to seven or eight spinose at apex, the spines stout, prominent, diminishing gradually in length, scape 3.4 x as long as broad, a little shorter than third segment (8.5:9.5), second segment one and one-half times as long as broad, subequal in width at base and apex, sides obtusely tuberculate at middle, dorsal surface with a pair of rounded subbasal tubercles; integument almost impunctate, with a few scattered long erect hairs, especially at sides; scutellum very finely, inconspicuously pubescent, the pubescence denser along posterior margin; prosternum deeply transversely impressed at middle, convex anteriorly, intercoxal process narrow between the coxae, arcuately declivous, apex expanded and emarginate. Elytra more than three and one-half times as long as pronotum, nearly three and one-half times as long as basal width; surface sparsely, irregularly punctate on disk, more densely at sides, with scattered, suberect yellowish hairs; apices separately emarginate, bispinose, outer spine longer and more definitely spiniform.

Legs elongate, sparsely clothed with long, suberect pale hairs; femora abruptly clavate and pedunculate, intermediate pair obtusely bidentate at apex, posterior pair acutely bidentate or subspinose at apex; tibiae longitudinally carinate. Abdomen almost impunctate, with a few scattered suberect hairs; fifth sternite broadly truncate at apex. Length 13 mm., breadth 2.7 mm.

Type, female, Morco, Florida, April 17, 1912, and one paratype, female, April 15, 1912, both in the collection of the American Museum of Natural History.

This is the first species of *Stizocera* known from the United States, although five species are known from the West Indies including one each from the Cayman Islands, Jamaica, Haiti, and Puerto Rico. The present species is more closely related to the West Indian forms than to those now known from Mexico. From *insulana* (Gahan) and *caymanensis* Fisher it differs in having the tibiae carinate, from *vanzwaluwenburgi* Fisher in the elongate pronotum, short elytral spines, and from all three species in the arrangement of the dorsal pronotal callosities. *S. dozieri* Fisher and *S. poeyi Chevr.* are differently colored and otherwise distinct from *floridana.*

A SYNOPSIS OF NORTH AMERICAN ANAPHOIDEA

(Hymenoptera: Mymaridae)

BY RICHARD L. DOUTT[1]
Division of Biological Control, University of California

The mymarid genus *Anaphoidea* is probably of cosmopolitan distribution for species have been described from Europe, Africa, Australia, North America, and the West Indies. Two species have been utilized in biological control projects, and an appreciable reduction in the numbers of the eucalyptus weevil, *Gonipterus scutellarus* Gyll., followed the introduction of *Anaphoidea nitens* into South Africa from Australia (Clausen, 1940).

The published host records confined the genus to species of weevils until Bakkendorf (1934) reared *A. conotracheli* (Girault) from the eggs of a Chrysomelid and also from the eggs of a Dytiscid, *Agabus* sp. An entirely new host record, which extends the host range of the genus to the Hemiptera (*Gerris* sp.) is introduced in this paper.

Recent collections made in California indicate that the genus is by no means an uncommon element in the faunal pattern of the pacific slope, and four new species are described herein.

Anaphoidea conferta Doutt, new species

Female. Length 0.55 mm. General body color very dark brown. Eyes fuscous. Trochanters, femora, tibiae, tarsi except metatarsal segments pallid testaceous; metatarsi darker. Forewings fumated except for clear area extending longitudinally through wing blade center, expanding distally. Another clear area beneath anterior portion of venation. Posterior wings fumated, slightly maculate.

Antennae inserted high on face. Structure as in Fig. 1. Scape strongly convex ventrally. Pedicel half length of scape. Funicle unusual for genus, segments short, subglobular to quadrate. Funicle segment 1 small, subglobular. Funicle 3 largest funicle segment, a third longer than wide, longer and broader than segment 2. Funicle segment 4 wider than long. Funicle segments 5, 6 slightly longer than wide, subequal to segment 3. Club longer than last 3 funicle segments considered together; nearly twice funicle width. Club divided, distal segment longer than basal segment.

[1]Assistant Entomologist in the Agricultural Experiment Station.

Head about as wide as long, without distinct sculpturing. Sparsely covered with setae, alveoli pallid, conspicuous.

Thorax normal for genus, mostly smooth; faint reticulation on parapsides and scutum. Faint striations on scutellum. Parapsidal sutures distinct.

Forewings as in Fig. 2. Relatively long considering body size. Longest marginal cilia somewhat longer than greatest wing width. About 10 lines of discal cilia at greatest wing width. Posterior wings with complete row of discal cilia near caudal margin. Similar row of 10-12 cilia near distal half of cephalic margin.

Trochanters two segmented, femora somewhat swollen. Foretibial spur not forked. Tarsal segments short, basitarsi barely longer than segment 2.

Abdomen ovoid, scarcely longer than wide, sparsely covered with long setae. Ovipositor not projecting beyond apex of abdomen, nor produced anteriorly beneath thorax.

Male. Unknown.

Described from single specimen mounted in gum damar. *Holotype,* female, collected by sweeping native vegetation at OAKVILLE, CALIFORNIA, on May 3, 1948 (R. L. Doutt).

Type deposited in collection of the Division of Biological Control, University of California.

The antennal characters, particularly the expanded scape and the subglobular funicle segments, serve readily to distinguish *conferta* from all other North American species.

Anaphoidea gerrisophaga Doutt, new species

Female. Length 0.50 mm. Head, thorax, abdomen, antennae of brown color. Legs, somewhat lighter. Margin of forewings fumated. Posterior wings fumated. Eyes deep red, nearly black. Ocelli red.

Antennae inserted high on face, general conformation as in Fig. 1. Scape, pedicel of equal width; funicle segment one small, normal for genus; segment 2 smaller than 3; segments 5, 6 somewhat longer and wider than segment 2. Club divided, segments subequal; club wider than scape.

Head about as wide as long; distinctly broader than thorax. Frontovertex reticulate, bearing 4 distinct, erect setae as viewed frontally; another pair of setae located near upper margin of each eye. Eyes slightly hispid. Ocelli large. Mandibles with 3 large, coarse, equal teeth.

Pronotum with 4 large curved setae. Mesoscutum with 2 prominent setae, each near anterior portion of respective parapsidal suture. Each axilla with single seta.

Forewings very narrow, fig. 2, unusual for genus, nearly parallel sided with no marked expansion distally. Tibial spur of foreleg bifid, basitarsus longer than following segment.

Abdomen long, oval, nearly twice longer than wide. Ovipositor barely projecting beyond apex of abdomen, not produced anteriorly beneath thorax.

Male. Unknown.

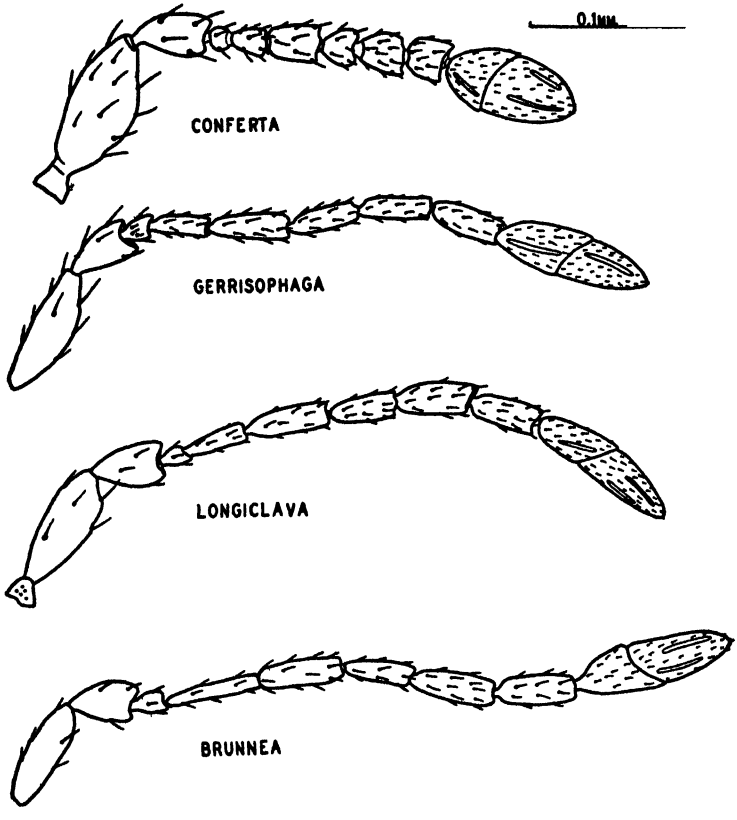

Figure 1. Antennae of new species of *Anaphoidea* from California.

Described from two specimens mounted in gum damar, on individual slides. *Holotype,* female, reared from eggs of *Gerris* sp., LAKE BRITTON, SHASTA COUNTY, CALIFORNIA, on June 29, 1947 (R. L. Usinger). *Paratype,* female, collected on window, El Cerrito, California, on June 11, 1948 (R. L. Doutt).

Holotype and paratype in collection of Division of Biological Control, University of California.

This species is characterized by the very narrow forewings which are nearly parallel sided and lack any marked distal expansion. The prominent setae on thorax and frontovertex together with the large ocelli also serve to separate *gerrisophaga* from other American species. The *Gerris* host record is unique for the genus.

Anaphoidea longiclava Doutt, new species

Female. Length 0.45 mm. Color variation in specimens examined ranged from pallid brown to dark brown. Forewings mostly hyaline, slightly fumated in band near apex of venation and around distal wing margin. Eyes black, ocelli red.

Antennae inserted high on face, form as in Fig. 1. Scape convex ventrally, with slight reticulate sculpturing. Scape, pedicel of equal width. Funicle segment 1 small, segments 2, 4 subequal, smaller than segment 3. Segment 5 subequal to 3. Segment 6 of same length as segments 2, 4 but wider. Club elongate, divided, somewhat wider than funicle, distal segment longer than basal segment.

Head about as wide as long. Area posterior to ocelli with reticulate sculpturing, face and frontovertex nearly smooth.

Thorax normal for genus, nearly smooth but scutellum finely striate, scutum with faint reticulations anteriorly. Legs normal, foretibial spur curved, bifid. Basitarsi about equal in length to following segments, not distinctly longer. Forewings of moderate width, fig. 2. Posterior wings with sparse row of discal cilia near cephalic margin and more complete row near caudal margin.

Abdomen ovoid, distinctly shorter than thorax, dorsal surface with transverse rows of long conspicuous setae. Ovipositor slightly produced forward beneath thorax, ovipositor barely projecting from apex of abdomen.

Male. Unknown.

Described from two specimens mounted in gum damar on individual slides. *Holotype,* female, collected by sweeping native vegetation at MORGAN HILL, CALIFORNIA, on July 2, 1947 (R. L. Doutt). *Paratype,* female, collected by sweeping *Salix* sp. at Rio Nido, California, on May 28, 1947.

Holotype and paratype deposited in collection of Division of Biological Control, University of California.

The species *longiclava* is easily separated from *conotracheli* by the narrow club, the relatively more elongate funicle segments, and by lacking a marked projection of the ovipositor beneath the thorax.

Anaphoidea brunnea Doutt, new species

Female. Length 0.46 mm. Head, thorax, abdomen dark brown. Legs, antennae somewhat lighter. Forewings hyaline except for indistinct fumation near venation and along distal portion of cephalic margin. Posterior wings with slight maculation. Eyes, ocelli black.

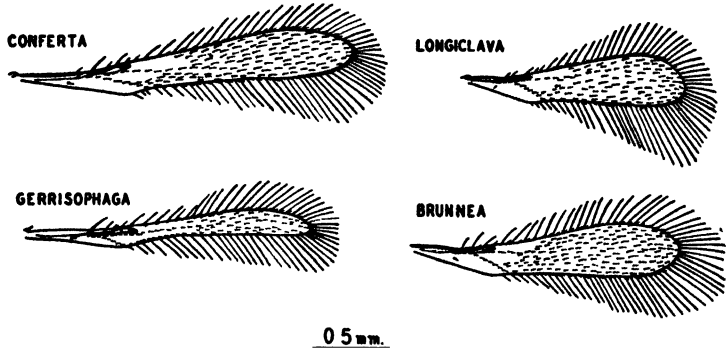

Figure 2. Wing outlines of new species of *Anaphoidea* from Calif.

Antennae inserted high on face. Scape not strongly convex ventrally, fig. 1. Pedicel slightly wider than scape, wider than funicle. Funicle segment 1 small, segment 2 longest, narrowest funicle segment. Funicle segment 4 distinctly smaller than 3 or 5. Segments 3, 5, 6 subequal. Club divided, widest antennal structure equal in length to funicle segments 5, 6, combined.

Head somewhat longer than wide. Thorax mostly smooth with barely perceptible striations. Fore femora more swollen than middle or hind femora. Spur of foretibia curved, bifid at tip. Basitarsus of foreleg distinctly longer than subsequent segment. Basitarsi of middle and posterior legs barely longer than subsequent segments. Forewings of moderate width, Fig. 2. Posterior wings with a row of discal cilia near distal portion of wing blade center; a sparse row of discal cilia near cephalic margin, another complete row on caudal margin.

Abdomen much shorter than thorax, ovoid. Ovipositor distinctly produced forward beneath thorax.

Male. Unknown.

Described from four specimens mounted in gum damar on individual slides. *Holotype,* female, and 2 female paratypes collected by sweeping native vegetation at FORESTVILLE, SONOMA COUNTY, CALIFORNIA, on April 16, 1947 (R. L. Doutt). One paratype female collected on window, El Cerrito, California, on March 6, 1948 (R. L. Doutt). Holotype and 2 paratypes deposited in collection of Division of Biological Control, University of California. One paratype deposited in U. S. National Museum.

In comparison with *calendrae* and *conotracheli*[2] this species is easily differentiated by the second funicle segment which is distinctly longer than segment 3. The forewings are relatively broader than those of *calendrae*.

KEY TO NORTH AMERICAN ANAPHOIDEA

FEMALES

1. Funicle segments except segment 1 distinctly longer than wide 2
– Funicle segments subglobular or quadrate, scape strongly convex ventrally ..... *conferta* Doutt
2. Funicle segment 2 distinctly longer than segment 3 3
– Funicle segment 2 not distinctly longer than 3, may be equal to 3 4
3. Funicle segment 2 narrowest funicle segment, segment 4 smaller than all segments except 1. Species brown, moderate size ..... *brunnea* Doutt
– Funicle segment 2 no slenderer than other segments; cephalic tibiae yellow, body black, large species ..... *sordidata* Girault[3]
4. Forewings quite narrow, more or less parallel sided without marked distal expansion, see fig. 2. Funicle 2 distinctly shorter than 3 ..... *gerrisophaga* Doutt
– Forewings of moderate width, normal, if narrow then funicle 2 subequal to 3 5
5. Basitarsi distinctly longer than following segments. Funicle segment 2 nearly equal to segment 3. Funicle segment 6 shorter than any segment except segment 1 ..... *calendrae* Gahan
– Basitarsi not distinctly longer than following segments 6
6. Ovipositor strongly produced anteriorly beneath thorax ..... *conotracheli* (Girault)[4]
– Ovipositor not strongly produced anteriorly beneath thorax ..... *longiclava* Doutt

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CLAUSEN, C. P. 1940. Entomophagous Insects. McGraw-Hill Book Co., Inc. 688 pp.

[2]The author wishes to acknowledge the generous loan of specimens for study by C. F. W. Muesebeck and A. B. Gahan of the U. S. National Museum.

[3]No specimens of *sordidata* examined, data in key taken from literature.

[4]Girault (Private publication) synonymised *pulliorura* Girault and *luna* Girault with *conotracheli* (Girault).

SEPSIDAE FROM THE AUSTRALASIAN REGION
(Diptera)

BY GEORGE C. STEYSKAL
Grosse Ile, Michigan

Two small collections of Sepsidae, made respectively by Clifford O. Berg and Jean Laffoon while they were engaged in malaria control work with the armed forces during the recent war, were generously turned over to the writer for determination, and an interesting lot of regional material belonging to the United States National Museum was also made available through the kindness of Curtis W. Sabrosky. Study of the material has brought to light two new species and one new subspecies, some synonymy, and some distributional data from little known areas.

KEY TO THE AUSTRALASIAN GENERA OF THE FAMILY SEPSIDAE

(Mesopleural bristle always present, although small in *Toxopoda* and *Perochaeta*. The Formosan genus *Myrmecosepsis* Kertész [1914, Ann. Mus. Nat. Hung. 12:244], not included below, was placed in the Chloropidae by its describer, but Hennig [1941: 131] has listed it with the Sepsidae; it is an almost wingless fly with long, erect, quill-like bristles on the dorsum).

1 (2). First and second basal cells of wing united; orbital bristles lacking; abdomen constricted behind second tergite; abdominal macrochaetae present ..... *Australosepsis* Malloch

2 (1). First and second basal cells separated 3

3 (4) Thorax and abdomen dull black; abdomen with silvery pruinose bands; abdominal tergites lacking bristles and setae; humeral bristle minute; outer verticals (postoculars) lacking; one pair of DC*; lower margin of face projecting; middle femora of male bent in middle..... *Toxopoda* Macquart

4 (3). Body usually shining, at least on parts of pleura; microsetae present, and often macrochaetae on abdomen 5

5 (12). A pair of strong orbital bristles present; abdomen lacking macrochaetae except at tip, not or but slightly constricted behind second tergite; always only one DC; wings not spotted 6

*The following abbreviations are used: DC - dorsocentral bristles of mesonotum; PV - postvertical bristles; *tp* - hind crossvein (*transversa posteriora*).

6 (7). PV lacking; one or two strong acrostichals behind the suture; humeral bristle present; preapical tibial bristles evident on middle and hind legs; male hind tibiae with dorsal slit or "cicatrix" ..... *Xenosepsis* Malloch

7 (6). PV present; no strong acrostichals 8

8 (9). Humeral bristle lacking; vibrissae duplicate; male fore tibiae with ventral emargination bearing in its middle a broad, scraper-like tooth ..... *Decachaetophora* Duda

9 (8). Humeral present; only one well developed vibrissa 10

10 (11). Wings distinctly gray; genal bristle strong; male hypopygium with forked lateral processes; fourth sternite tufted; female fore femora with a small anteroventral bristle at apical third ..... *Parameroplius* Duda

11 (10). Wings hyaline or scarcely gray; genal bristle indistinct or lacking; male hypopygial processes simple, cruciate, with dense, long hairs and bristles on convex side; fore femora of female anteroventrally with four bristles (*M. beckeri*) or without bristles (*M. sauteri*) ..... *Meroplius* Rondani

12 (5). Orbital bristles lacking or very small; abdomen with or without preterminal macrochaetae, strongly constricted behind second tergite; usually two DC; wing with or without spots 13

13 (14). Humerals and postoculars lacking; no wing spots; one DC; abdomen without macrochaetae; male with peculiar lateral processes on fourth sternite ..... *Perochaeta* Duda

14 (13). Humerals and postoculars present; wing spot present at tip of second vein or apically or wing unmarked or marked basally only 15

15 (16). Front, thorax, and legs with long hair; one DC; no abdominal macrochaetae ..... *Lasionemopoda* Duda

16 (15). Front without hair; two DC (except in some species of *Sepsis*); wing spot and abdominal macrochaetae present or not 17

17 (18). Abdomen of the male always, and often of the female also, with distinct macrochaetae; wing spot, if present, only in vicinity of vein 2 ..... *Sepsis* Fallén

18 (17). Abdomen of both sexes without distinct macrochaetae, although sometimes with somewhat stronger hairing of the tergal margins and with strong anal bristles; wing darkened along costa basally and sometimes with apical spot 19

19 (20). Wings blackened only at base; sternopleura shining anteroventrally ..... *Dicranosepsis* Duda

20 (19). Wings with spot at or near tip; sternopleura wholly or partly pruinose ..... *Parapalaeosepsis* Duda

The description of *Xenosepsis sydneyensis* Malloch (1925: 315) is insufficient to distinguish it from the generitype of *Pseudomeroplius* Duda (*P. acrostichalis* Duda, 1926a:11), the only point of difference being in the number of strong acrostichals. The latter genus is therefore considered synonymous.

The writer cannot distinguish two categories of generic rank in *Parapalaeosepsis* and *Poecilopterosepsis*: he accordingly considers the latter synonymous on the basis of page priority (Duda 1926a:42 and 43 resp.). The generitype of *Parapalaeosepsis* is *Sepsis plebeia* De Meijere, the sole originally included species. The known species, together with two new species and one new subspecies, may be separated in the male sex as in the following table. The species are characteristically New Guinean. Those examined by the writer (*P. apicalis, P. basifera, P. laffooni,* and *P. mesopla*) have a single distinct, posteriorly curved bristle at the apex of each hind coxa, weak and short in *P. mesopla,* but strong in the others.

KEY TO MALES OF THE GENUS PARAPALAEOSEPSIS

1 (2). Middle basitarsi compressed, much broader than second tarsal joint and furnished with scales; claspers pointed (Amboina; Aru Is.; New Guinea) .....*P. basifera* Walker

2 (1). Middle basitarsi slender, cylindrical, not greater in diameter than second joint 3

3 (4). Middle femora armed beneath with strong spinules projecting apicad at an angle of 45° from tuberculiform bases; wings with median cloud (New Guinea) ....*P. mesopla* Steyskal

4 (3). Middle femora not armed as above; wings without median cloud 5

5 (6). Middle basitarsi partly black; crossveins as far apart as 1.5 times length of *tp;* a basally directed spinule present between the two longer apically directed ones posteroventrally [Curran 1928:119]; Matema Id., Santa Cruz Group [Curran 1936: 31]; New Guinea; Lesser Sunda Is.; India; Ceylon; Formosa) .....*P. plebeia* De Meijere

6 (5). Middle basitarsi wholly yellowish, at most narrowly blackish at tip; crossveins not farther apart than length of *tp* 7

7 (8). Fore tibiae distinctly emarginate medially; wing spot large, extending to or nearly to fourth vein; claspers spatulate at tip (New Guinea; Solomon Is.) ....*P. apicalis* De Meijere

8 (7). Fore tibiae not emarginate; wing spot smaller 9

9 (10). Wing spot large, extending from before tip of second vein to or shortly beyond third vein; claspers cultriform ..... *P. laffooni* Steyskal

a. Wing spot filling out tip of submarginal cell, extending into first posterior cell (New Hebrides) ..... *P. laffooni laffooni*

b. Wing spot roundish, not filling out tip of submarginal cell, extending only to third vein (New Caledonia) ..... *P. laffooni noumeae* Steyskal

10 (9). Wing spot consisting of a band from before middle of second costal section to beyond end of third vein; claspers ? (New Guinea) ..... *P. limbata* De Meijere

In the course of the writer's work on the material listed below he came to certain conclusions regarding synonymy of some of the species. He was pleased to find that Hennig, who admirably figured some of the diagnostic parts, came to similar conclusions in his work on the Lesser Sunda Islands material (1941a). The writer has used the distinctions tabulated below in making his determinations in the genus *Sepsis*.

KEY TO THE AUSTRALASIAN SPECIES OF THE GENUS SEPSIS*

1 (10). Wing entirely without spot at end of second vein; pteropleura sometimes pruinose 2

2 (5). Sternopleura anteroventrally strongly shining, not pruinose 3

3 (4). Abdomen rugulose, dully shining; middle tibiae with a strong bristle dorsally at the apical sixth; pteropleura partly pruinose; hind femora with a distinct ventral bristle near base; male fore femora with a very strong tooth-like projection slightly apicad of middle bearing a few crowded stubby spinules, closely apicad of which is a secondary tubercle bearing only small and weak bristles; male fore tibiae simple, straight or sinuate, unarmed; male hind femora clavate ..... *S. indica* Wiedemann (*S. spectabilis* De Meijere)

4 (3). Abdomen scarcely rugulose transversely and strongly shining; middle tibiae at most with a small subapical bristle; pteropleura wholly shining; male fore femora with stout bristle at middle (mid-spine), immediately apicad of which is a rather broad tubercle bearing several stubby spinules; male fore tibiae sinuate below, armed with a curved row of spinules in basal half; male hind femora not clavate ..... *S. lateralis* Wiedemann

5 (2) Sternopleura wholly pruinose 6

*Some species of Walker and Brunetti remain unelucidated.

6 (7). Pteropleura pruinose; abdomen shining; male fore femora and tibiae of *S. indica* type..... .....*S. trivittata* Bigot; *S. decipiens* De Meijere

Hennig (1941a:146) considered *S. trivittata* a synonym of *S. indica*, and the writer suspects likewise of *S. decipiens*, but he lacks material.

7 (6). Pteropleura shining; male fore femora with a mid-spine, apicad of which is a more or less distinct tubercle; male fore femora armed with a row of spinules basiventrally.... 8

8 (9). Male fore femora ventrally beyond the mid-spine with a large yellow apically spinulate process; male fore tibiae postero-apicad of the row of spinules with a short, thorn-like process; hypopygial processes slender and short..... .....*S. tuberculata* Duda

9 (8). Male femora with a broad low hump furnished with several rather large spinules apicad of mid-spine; male fore tibiae basally with a short row of spinules immediately followed by a bare roundish swelling; hypopygial processes longer and stouter .....*S. coprophila* De Meijere

10 (1). Wings with a more or less distinct spot or spots in vicinity of end of second vein or directly over same; pteropleura shining 11

11 (12). Sternopleura wholly pruinose; only one DC, rarely with weak second one; male fore femora of *S. punctum* type, with a small apically directed process in the emargination; hypopygial process short and broad ....*S. latiforceps* Duda

12 (11). Sternopleura at least anteroventrally shining; two well developed DC 13

13 (14). Distal section of third and fourth veins distinctly convergent; spot at tip of second vein unusually small and roundish; cheeks approximately as wide as third antennal joint; hind femora without bristles; male fore femora without anterobasal hairy patch, with a few spinules below in apical third; hypopygial processes with a small anterior tubercle, apicad of which they are curved forward C-wise .....*S. thoracica* Rob.-Desv.

14 (13). Distal section of third and fourth veins almost parallel; male fore femora with anterobasal patch of hair, without spinules below in apical third 15

15 (16). Wing tip, except the veins, whitish, the dark spot elongate, diffuse, cheeks half as wide as third antennal joint; male hind femora with anterodorsal preapical bristle ....*S. albopunctata* Lamb

16 (15). Wing tip not whitish; cheeks approximately as wide as third antennal joint; male hind femora without bristles.... .....*S. barbata* Becker

NOTES ON MATERIAL EXAMINED

AUSTRALOSEPSIS NIVEIPENNIS Becker

SOLOMON IS.: New Georgia, September 4 (C. O. Berg).

NEW HEBRIDES: Espiritu Santo, Segond Channel, November 4, 1943. (J. Laffoon).

Duda (1926:31) referred this species to his genus *Saltelliseps.* In the previous year Malloch (1925:514) described *Australosepsis fulvescens* and a variety *atratula,* which are apparently the same as Becker's species. Malloch suggested the specific and stated the generic synonymy (1928:307; 1928a:611), and Hennig (1941a:146) has made the combination. The males of our material are nearly all of a yellowish or reddish color, while the females are black. A similar condition is found in *A. tenella* De M. (v.i.). *A. niveipennis* is known from several localities in Africa (Morocco, Egypt, Abyssinia, Togo), Formosa, Lesser Sunda Is., Philippine Is., and Australia.

AUSTRALOSEPSIS TENELLA De Meijere

PHILIPPINE IS.: Los Baños, Luzon (Baker); Puerto Princesa, Palawan, August 12, (R. C. McGregor), both in USNM.*

Hennig (1941a:146) found the proportion of red to black males to be 45:12. Our material is approximately in that proportion also, but intermediates make it difficult to make a numerical statement. The species is known from Ceylon, Singapore, Lesser Sunda Is., Philippine Is., Formosa, and New Caledonia.

DICRANOSEPSIS BICOLOR Wiedemann

SUMATRA: Blang Rakal, NGS SI Exp. 1937 (Mann), in USNM.

PHILIPPINE IS.: Manila, October, 1924 (R. C. McGregor, Robert Brown); Limay, Bataan (R. C. McGregor); Puerto Princesa, Palawan, August 12, 1925 (R. C. McGregor), all in USNM.

RYUKYU IS.: Okinawa Id., June 22 to July 12, 1945 (W. G. Field, F. N. Young), in USNM.

MARIANA IS.: Point Oca, Guam, May, 1945 (G. E. Bohart and J. L. Gressitt); Asan, Guam, Jan. 31, 1948, near carabao dung (K. L. Maehler); Inarajan, Guam, December, 1947, on carabao dung, all in USNM.

*United States National Museum.

NEW GUINEA: Cyclops Mts., 1000 ft. (J. Laffoon); Finschhafen, November 9, 1944 (D. G. Hall), in USNM.
SOLOMON IS.: Guadalcanal, September 10, 16, November, 1944 (C. O. Berg); New Georgia (Berg).
NEW HEBRIDES: Espiritu Santo, Segond Channel, August, 1944 (J. Laffoon).

It has not been feasible to distinguish any of the many named "varieties" in the present material. The distinctions cited by Duda (1926:47; 1926a:54) apparently occur within populations; all forms, for example, are cited from Formosa (cf. also Hennig 1941:131). Hennig (1941a:146) considered it advisable to treat them as "Formen einer Art."

The species is known from India to Formosa and southward to New Guinea, but apparently not yet from Australia. Curran (1936:32) recorded it as *Sepsis javanica* De M. from San Cristoval Island in the Solomons and Matema Island in the Santa Cruz group.

LASIONEMOPODA HIRSUTA De Meijere

AUSTRALIA: Botany Bay and Blawarra, New South Wales (H. Peterson), in USNM.

An easily recognized species thus far recorded only from Botany Bay, Sydney, Parramatta, and Como, all in New South Wales.

PARAPALAEOSEPSIS APICALIS De Meijere
(Figure 1a)

NEW GUINEA: Finschhafen, April 9, 1944 (E. S. Ross), in California Acad. Sci.
SOLOMON IS.: Guadalcanal (C. O. Berg); l.c., November, 1944 (J. Laffoon), in USNM.

The reasons for referring this species to *Parapalaeosepsis* have been given above. The species has been previously found only in New Guinea (S. E. Paumomu River and Astrolabe Bay).

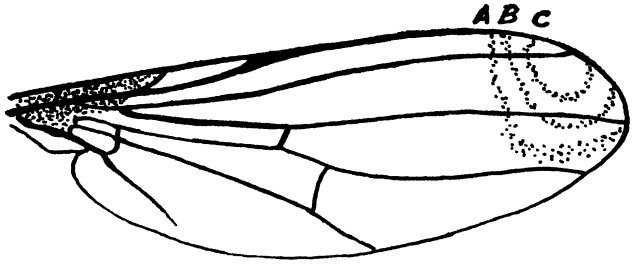
PARAPALAEOSEPSIS BASIFERA Walker

NEW GUINEA: Cyclops Mts., 1000 ft., March, 1945 (J. Laffoon), in USNM.

Known from Amboina, Aru Is., and New Guinea (Paumomu River).

Parapalaeosepsis laffooni Steyskal, new species (Figure 1b, c)

Male and Female—Length 3.4 mm. Very similar to *P. apicalis* De M. and *P. limbata* De M., differing as shown in the foregoing key. Purple-black in color, except parts of the legs as follows: fore legs as far as middle of third tarsal joint; middle and hind legs as far as basal fourth of femora, the transition to black rather gradual; apical fourth of middle tibiae, also with gradual transition; middle tarsi to middle of third joint; these parts yellowish. Middle basitarsi equal in length to remainder of tarsi, slender and cylindrical. Sternopleura strongly pruinose except on the shining lower anterior aspect. Posterior half of pteropleura also pruinose. Wings hyaline except small basal area and large apical brown area, as in figure.



Wing of *Parapalaeosepsis apicalis* DeM., male showing extent of apical spot in A) *P. apicalis* DeM., male; B) *P. laffooni* n. sp., male; C) *P. laffooni* n. sp., female.

Male—Hypopygium with cultriform processes, rather sharply pointed at tip. Fore femora and tibiae in posterior view very similar to those of *P. basifera* Wlk., as figured by Duda (1926a:105, pl. VIII, fig. 68a), the anterior face with two small, more distinct setulae near base, slightly basad of middle with one large and two moderate posteroventral spines (the latter of which are half as long as the former) and one anteroventral spine nearly as long as the large posteroventral. Fore tibiae not emarginate medially.

Holotype, male, NEW HEBRIDES, ESPIRITU SANTO ISLAND, Segond Channel, July, 1944, no. 143 (Jean Laffoon), and *Allotype*, female, same data, no. 138, in USNM, type no. 58802; *Paratypes*, same data, nos. 135, 138, 139, one pair in the author's collection, the remainder in the collection of Jean Laffoon.

Parapalaeosepsis laffooni noumeae Steyskal, new subspecies

Male and Female—Similar to the typical form, but with a reduced wing spot. In the male the spot barely attains the third vein posteriorly and toward the wing tip only shortly beyond the tip of vein 2, leaving an appreciable area in the tip of the sub-

marginal cell hyaline. The wing spot of the female is but very slightly smaller than in the typical subspecies.

Holotype, Allotype, and four female *Paratypes,* NEW CALEDONIA, NOUMEA, July 24, 1944 (Wilfred Crabb), no. 58803 in USNM.

Parapalaeosepsis mesopla Steyskal, new species

Male—Length 5.1 mm. An aberrant species, distinguished as in the foregoing key.

General color black. Fore legs yellow, except for rather brownish femora and two black ultimate tarsal joints. Hind femur gradually becoming yellowish in the basal fifth and middle tibiae also a little brownish toward tip. Only a basal part of one middle basitarsus is preserved; this and the basal two joints of the hind tarsi are yellowish. Face also rather yellowish. Antennae beyond the first join missing.

Mesonotal disc brownish pruinose, humeri, propleura, stripe above the fore coxae, lateral aspect of sternopleura, and the entire pteropleura, bluish white pruinose. Hypopygium (well turned in) yellowish.

Wings hyaline, costal cell and root area blackish, a diffuse light brown cloud over *tp* and extending into submarginal cell, wing tip from before second vein to beyond fourth vein broadly dark brown, membrane between the median cloud and the brown tip whitish.

Fore femora straight above, below sloping in a straight line to each end from a neatly median group of four rather small spines on a tiny tubercle. Fore tibiae straight, somewhat tumid in apical two-fifths, where they are furnished with many fine erect hairs, some of which are also present on all joints of fore tarsus. Middle femora equal in length to hind, but a little heavier and furnished below with a double row of short but stout spinules placed on tuberculiform bases and directed approximately 45° apicad. Apical two-fifths of middle tibiae bearing on ventral and posterior surfaces a group of about 16 macrochaetae, each about as long as diameter of tibia.

Apparent first abdominal segment with a pair of strong lateral bristles and a group of ten rather long dorsal ones. Abdomen somewhat collapsed apically, but shining and furnished with coarse hairs and at least a pair of strong macrochaetae on the dorsum of hypopygium.

Holotype, male, CYCLOPS MTS., NEW GUINEA, 1000 ft., March, 1945 (Jean Laffoon), in USNM, type no. 58804.

SEPSIS ALBOPUNCTATA Lamb

NEW HEBRIDES: Espiritu Santo, Segond Channel, January 2, July August, 1944 (J. Laffoon); l.c., September, 1944 (K. L. Knight), in USNM.

Sepsis hirtifemur Malloch (1925:312) is apparently synonymous. The species is known from Eastern Africa, Madagascar, Seychelles Is., Australia (New South Wales), and Lesser Sunda Is.

SEPSIS INDICA Wiedemann

PHILIPPINE IS: Los Baños (Baker); Manila; Limay, Bataan; Silang, Cavite (all R. C. McGregor), all in USNM; Puerto Princesa, Palawan, August 12, 1925 (R. C. McGregor), in USNM.

The writer agrees with Hennig (1941:146) that *S. spectabilis* De Meijere is synonymous and believes it likely that *S. trivittata* Bigot and *S. decipiens* De Meijere may be also. Curran (1936:31) recorded a single female of *S. spectabilis* from Bellona Id. in the Solomons. Other records place it as widespread in the Australasian region east to New Guinea and the Philippine Is.

SEPSIS LATERALIS Wiedemann

RYUKYU IS.:Okinawa Id., 1945 (W. D. Field), in USNM.
PHILIPPINE IS.: Manila (Robert Brown), in USNM.

The species is a widespread one in the Mediterranean region and the Near East, Africa, Madagascar, India, China, Formosa, and New Guinea.

SEPSIS TUBERCULATA De Meijere

PHILIPPINE IS.: Victorias, Occ. Negros, September 19, 1927 (W. D. Pierce); Puerto Princesa, Palawan (R. C. McGregor), both in USNM.

Known from Ceylon, Java, Formosa, Australia (North Queensland), and Lesser Sunda Is.

TOXOPODA NITIDA Macquart

SUMATRA: Brastagi, May (F. J. Meggitt), in USNM.
NEW GUINEA: Finschhafen, September 9, 1944 (D. G. Hall), in USNM.
SOLOMON IS.: New Georgia; Guadalcanal (C. O. Berg).

The writer believes that this is the only known species of *Toxopoda* and that *T. atrata* Malloch (1928:308; 1928a:611) is a synonym. It is known from North and Central Africa, India, China, Formosa, Philippine Is., Lesser Sunda Is., and Australia (Queensland).

It seems pertinent to mention that no Sepsidae have been

recorded in the British Museum's monumental work on the insects of Samoa and that Bezzi (1928) recorded none from Fiji.

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ANOTHER RECORD OF FLEBOTOMUS IN CALIFORNIA

(Diptera: Psychodidae)

In September of 1947 two specimens of the genus *Flebotomus* were taken within my residence at 960 Vermont Street, San Jose, Santa Clara County, California. Both specimens were given to Dr. M. A. Stewart of the University of California. On May 24, 1948, another specimen was caught flying to a lamp in my apartment. Using the descriptions given by Mangabeira, O. F. and P. Galindo (The Genus Flebotomus in California, American Journal of Hygiene 40(2): 182-195, 3 pl. 1944) this specimen, a male, was determined to be *Flebotomus vexator* Coq., previously recorded from creek beds and ground squirrel holes in Alameda and Contra Costa Counties.—CHARLES P. HOYT, *Stanford University, California.*

THE ANTS OF BIKINI ATOLL, MARSHALL ISLANDS[1]

(Hymenoptera)

BY A. C. COLE
Department of Zoology and Entomology,
University of Tennessee, Knoxville

During July and August, 1947, the writer was a member of the Bikini Scientific Resurvey Staff which made extensive studies of Bikini Atoll. In addition to collecting insects in general, the writer made a special effort to obtain and study representatives of all of the kinds of ants nesting on the islets.

Physical environmental conditions on Bikini Atoll are not particularly inducive to the maintenance and dissemination of ant colonies. The small size of the islets, together with the broad expanses of coral sand, the poor soil of the vegetated areas, and the inundation of many parts during severe storms are not favorable for extensive colonization by ants.

No species was present in any great abundance, either in colonies or in individuals, and ants were not a conspicuous element of the insect population. The ants nested in the soil, in or beneath detritus, in decayed and dry coconuts, and beneath the loose bark of dead trees. Few arboreal nests were found although many of the ants foraged on trees and shrubs. The most abundant and conspicuous component of the ant fauna was *Iridomyrmex anceps* (Roger). This species was taken on all of the well vegetated islets and even on Rokar Island with its scanty vegetation. In general the species of ants found on any one of the vegetated islets were those which also inhabited the other vegetated islets, although the proportions of nests of the different species varied somewhat. Most of the ants of Bikini Atoll are tramp species which have a wide distribution in Micronesia.

The various species and subspecies collected are the following ones the determinations of which have kindly been made by Dr. M. R. Smith:

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[1]Contribution no. 26, Dept. of Zoology and Entomology, Univ. of Tenn.

1. ODONTOMACHUS HAEMATODA (L.)

Rather numerous colonies were found nesting in soil in shaded areas beneath fallen coconut trees and loose stumps on Bikini, Namu, Enyu, and Prayer Islands. Males and females were in some of the nests from mid-July until mid-August. During this period some nests contained only workers and males whereas other nests contained only workers and females. The males took to the air almost immediately after having been exposed and flew away. The females scurried to cover but did not fly. No colony was large; the most populous ones contained only about 50 workers. The workers foraged slowly on the open soil during overcast days and early morning and late evening hours. When disturbed they moved rapidly.

2. MONOMORIUM DESTRUCTOR (Jerdon)

Several colonies of these tiny ants were collected from within fallen coconuts on Bikini, Namu, and Enyu islands. Workers and multiple queens were in the nests.

3. MONOMORIUM FLORICOLA (Jerdon)

This species was rather well represented on Bikini Island where it nested within the shells of fallen coconuts. It was less common but occupied the same habitat on Enyu, Namu, and Prayer islands.

4. MONOMORIUM PHARAONIS (L.)

Only two nests were found and these were in the soil beneath fallen pandanus fruit on Bikini Island.

5. PHEIDOLE sp.

Numerous workers of an unidentified species were taken as they were running on shaded soil of Namu Island. Soldiers were not collected and the nest was not found.

6. TETRAMORIUM SIMILLIMUM (F. Smith)

Isolated workers were taken on Bikini, Enyu, and Prayer islands but nests were not found.

7. TAPINOMA MELANOCEPHALUM (Fabricius)

Numerous workers were collected from trunks of trees on Bikini, Enyu, and Prayer islands.

8. TAPINOMA sp.

A single nest of what might possibly be *T. indicum* Forel was found beneath loose bark of a tree on scantily vegetated Rokar Island.

9. IRIDOMYRMEX ANCEPS (Roger)

This proved to be the most common ant on the islets. The workers construct in the sandy soil of open areas crater nests with usually a single, large, irregular, basal opening. A few nests with two or three openings were observed. The craters averaged approximately 6 inches in diameter. Colonies were populous and the workers very active. Brood was located in chambers about 7 inches below the nest entrance. Males were in the nests in mid-July. Workers were found running on the soil and up and down tree trunks. Nests were taken on Bikini, Enyu, Namu, Prayer, and Rokar islands.

10. PARATRECHINA (NYLANDERIA) BOURBONICA Forel

Isolated workers were taken on Bikini and Enyu islands. They were running on the ground.

11. PARATRECHINA LONGICORNIS (Latr.)

Workers were collected from foliage on Bikini, Enyu, Namu, and Prayer islands.

12. CAMPONOTUS RETICULATUS BEDOTI Emery

Workers were found running rapidly on tree trunks and limbs on Enyu and Namu islands.

13. CAMPONOTUS IRRITANS CHLOROTICUS Emery

Numerous large colonies were observed on Bikini, Enyu, Namu, and Prayer islands. Most of the nests were beneath fallen coconut palms and under rotting stumps in rather open areas with moderate sunshine. Those ants which nested beneath stumps burrowed into the stumps and placed their brood in the burrows. Brood was often found in abundance between the dry fronds of fallen coconut trees. The workers are very aggressive. Males and females were in the nests during July.

NOTES ON CERAMBYCIDAE FROM THE LOWER RIO GRANDE VALLEY, TEXAS

(Coleoptera)

BY GEORGE B. VOGT
University of Maryland, College Park

(Continued from page 144)

42. RHOPALOPHORA ANGUSTATA Schffr.

Two specimens from flowers of *Monarda* sp. at "3" on April 13, 1946. Another specimen at flowers of *Baccharis neglecta* Nutt. at "2" on September 30, 1946.

43. ORNITHEA MEXICANA Sturm

A single specimen under loose bark of a dead standing hackberry at "10" on April 28, 1947. Determined by Linsley.

44. STENOSPHENUS LUGENS Lec.

Frequent on flowers of goldenrod and *Baccharis neglecta* Nutt. at "2" during late September, 1946. Also two on flowers of yellow top at "8" on November 10, 1946. Three emerged on August 28, 1946, from the same *Oncideres* pruned tepehuaje branch described under 76.

45. STENOSPHENUS DOLOSUS Horn

Not uncommon during September on flowers of goldenrod, sunflower, and yellow top at "2," "8" and three and one-half miles west of Santa Rosa. Three specimens were also taken on March 31, 1946, from a huisache fence post at "10."

46. ANCYLOCERA BICOLOR Oliv.

Five specimens during April, July and September from "2," Pharr, and six miles southwest of Pharr. Three were on huisache, one on *Baccharis neglecta* Nutt. and one on fresh cut tepehuaje.

47. ELYTROLEPTUS DIVISUS Lec.

Frequent on flowers of coyotillo and to a lesser extent on flowers of lote at "6," "9," "22," and "23" during April and May. A single record from coyotillo at "9" on July 4, 1946.

48. CRIOPROSOPIS RIMOSUS Buq.

The larval work of this large colorful species is rather easily detected and is widespread in mesquite trees over the area. The adult beetles, however, are seldom seen unless they be chopped

out of their galleries before emergence. The following observations were made on the habits of the advanced developmental stages of this beetle.

The maturing larva lives in a spacious gallery in the sapwood, mostly less than one inch beneath the bark. The galleries vary in form but are usually straight, about twelve inches in length, and in places their width is about twice that, or more, of the inhabiting larva. Frass, fecula, and sap are cleaned from the walls of the gallery and voided through a small opening to the outside which is always kept plugged against the ubiquitous ants. It is these tailings which the collector should look for. During July, August, and September they are passed in conspicuous quantities. Openings to most galleries were observed near the bases of small to medium-sized mesquite (one and one-half to eight inches in diameter), the galleries often extending underground in roots in the case of smaller trees. But some characteristic work was noted in branches of large trees.

During October the larva enlarges the disposal opening to form an emergence hole which is then plugged tightly with the same type of wood shavings which are used within the gallery to form a pupation chamber. Observations in mid-January showed the larvae still to be in a prepupal stage. No further check was made until late March and April when pupae and teneral beetles were found in the galleries.

The following material is in the writer's collection. Fifteen specimens cut from second growth mesquite on April 27, 1947, and held individually for three weeks to harden. During this hold-over time some of the females oviposited. One specimen emerged from a caged tree on May 15. Nine other caged trees were unproductive due to marauding animals which ripped open the plastic screen, presumably in seeking the emerged beetles for food. One specimen also cut from huisache on April 22. A number of other infested huisache were noted at this locality. All of the above material was taken at locality "7" which was the most heavily infested area observed, with about ten per cent of the trees bearing 1-3 larvae. Infested trees were also observed at "5," "16" and "17" as well as in the towns of Pharr, San Juan, Donna and Weslaco.

The large exit holes left behind the emerging beetles are soon obliterated by wound growth of the tree which undergoes most of its trunk growth during May and June. The vigor of the tree seems unaffected by these borers.

49. STENASPIS SOLITARIA Say

Common on live mesquite at "19," "20," "21" and "22" during May and June, 1947. Larvae which are believed by the writer to be of this species were found in small living branches of mesquite and guajillo at "20" and one mile south of "18" respectively. These larvae live in long, straight, clean galleries which have openings at regular intervals. These openings serve for waste disposal and possibly for ventilation since they are unplugged. In this connection it is interesting to note that the slender cylindrical larva has its terminal segment strongly sclerotized and roughened, obviously as a protection against ants which have free access to the gallery. In the case of the co-tribal larva, *Crioprosopis rimosus*, which consistently plugs its gallery opening, the terminal segment is unmodified.

Unfortunately rearing of the larvae in branches cut in November failed, apparently due to the death of the wood. However, Dr. Anderson considers the larva to be probably a *Stenaspis* though it is unlike any in the U. S. National Collection.

50. STENASPIS INSIGNIS Csy.

Twelve male and one female specimens of this little known species were collected at flowers of coma at "9," October 20 through November 23, 1946.

51. TYLOSIS OCULATUS Lec.

Three specimens on September 29, 1946, from *Abutilon* sp. (probably *A. indicum L.*) growing along the roadside three and one-half miles west of Santa Rosa. Four specimens on November 10, 1946, from *Abutilon* sp. (probably *A. incanum* (Lind.) growing along a canal bank at "8."

52. PLIONOMA SUTURALIS Lec.

Frequent at flowers of coma and at fresh cut mesquite in a clearing at "9" during October and November, 1946. An aberrant record was made at "4" on May 26, 1946, when a specimen was taken on fresh cut brush.

53. TARANOMIS BIVITTATA Dup.

Common on flowers of coma at "9" during October and November, and on flowers of mesquite and *Acacia rigidula* Benth. at "5," "6," "7" and "9" February 16 through April 24, 1946. Also on goldenrod at "2" on September 28 and one specimen on flowering brasil at "9."

54. MANNOPHORUS LAETUS Lec.

Common on sunflower and yellow top growing on the roadside at "14" and three and one-half miles west of Santa Rosa during late September and October, 1946. Also two specimens from flowers of guajillo and lote at "22" during May, 1946.

55. DENDROBIAS MANDIBULARIS Serv.

Eight specimens on goldenrod at "2" on September 28, 1946. Six on *Croton punctatus* Jacq. and *Amaranthus* sp. in a weedy tomato field at "2" on June 15 and 22, 1946. One on willow post and one on ceniza (*Leucophyllum texanum* Benth.) in Pharr on April 29 and May 3, 1946. One in flight in clearing at "4" on July 27, 1946. Two in copula on fresh cut ebony in clearing three and one-half miles west of Santa Rosa on September 22, 1946. One on *Baccharis neglecta* Nutt. 14 miles east of Raymondsville on November 30, 1946.

56. LISSONOTUS FLAVOCINCTUS PUNCTICOLLIS Bates

Numerous records on decadent and fresh cut huisache at "6" and "7" May 19 - June 9, and November 10-17, 1946. One emerged on August 28, 1946, from a huisache branch from "6" which had been pruned by *Oncideres pustulatus*. Also five specimens, in company with numbers of 55, on goldenrod at "2" on September 28, 1946.

57. PARMENOSOMA GRISEUM Schffr.

Frequent beating Yucca cut during winter of 1946 in a clearing at "22," April 12 through September 20, 1947. Two under dead giant Opuntia branches at "22" on September 20, 1946. Five beaten from bases of *Agave heterocantha* Zucc., which had flowered the previous spring, at "17," November 23, 1946 and March 16, 1947.

58. MONEILEMA ARMATUM Lec.

This species was found exclusively in the dry uplands ("14," "16," "17," "18," "21," "22" and "23") where it occurred in fair abundance the year round on living as well as diseased and dead giant Opuntia. During the warmer seasons, these beetles were found mostly on the upper branches of living cacti where they often were seen feeding on the joints. They were found frequently also on tasajillo (*Opuntia leptocaulis* D. C.), and on one occasion early in March a teneral specimen was chopped from

its pupal cell in viznaga (*Echinocactus texensis* Hopffer).

Moneilema larvae, apparently of this species, on several occasions have been chopped from the trunks of giant Opuntia in the uplands. In late October, 1946, the writer had his first experience with larval Moneilema while overturning felled cactus at "14." Larvae were found under the joints and seemed to be associated as much with the coarse soil beneath as with the joints themselves leading to the writer's first impression that these Cerambycid larvae were subterranean in habit. This initial idea, while offset by subsequent observations, may be true to some extent and possibly explain the peculiar papillate ampulae possessed by these larvae.

59. MONEILEMA ULKEI Lec.

This species was found the year round being not uncommon in the Lower Valley at "4" and "5" but rather scarce in the dry uplands at "12," "16," "17" and "18." This beetle was always found associated with giant Opuntia, being taken under dead and fresh-cut cactus lying on the ground and on the upper joints of living cactus, sometimes feeding. On numerous occasions this species was found to feign death with the appendages rigidly arranged in a curious and characteristic manner as follows. Antennae extended forward, hind legs outstretched and directed partially backwards, middle legs directed straight backward between the hind legs, and the front legs outstretched anteriorly. *M. armatum* and *Parmenosoma griseum* were observed never to latisimulate in such a characteristic manner.

60. CYRTINUS PYGMAEUS (Hald.)

Two specimens, one swept from succulent vegetation at "10" on March 9, 1946; another on dead soapberry branch at "8" on April 5, 1947.

61. THRYALLIS UNDATUS Chev.

Frequent on fresh dead tepehuaje at "2." Also several emerged on April 1 and May 8, 1946, from the same Oncideres pruned tepehuaje branch described under 76. A single specimen was taken at "10" on July 6, 1946, from fresh felled hackberry remote from any tepehuaje.

62. LAGOCHIRUS PROCERUS Casey

On July 5, 1947, two males beaten from a yucca cut during

winter of 1946 in a clearing at "22." Both these specimens are small, measuring only 14.5 and 17.0 mm. in length.

63. LEPTOSTYLUS GIBBULOSUS Bates

Dr. J. N. Knull has examined some of the writer's specimens and considers them co-specific with his *L. monki* described from Donna, Texas. However, *gibbulosus* is used here since, as Mr. Fisher has pointed out to the writer, the material agrees well with Bates' description. This identification seems plausible in view of three similar specimens in the U. S. National Collection from Tampico and Chiapas, Mexico, which serve to bridge the gap between the Texas records and similar material from Central and South America which Bates describes as the habitat of his *gibbulosus*. The specimens in the U. S. National Collection and the material listed below show this species to be rather constant in form and markings.

The writer found this species in nature only as larvae developing in the fruit of soapberry. A study of several dozen infested fruit led to the following observations. The larva develops for the most part in the course of entirely consuming the oily contents of the seed (similar in properties to Brazilnut) which the young larva enters by way of the placenta. For the purpose of disposing of its fecula produced while developing in the seed, the larva probably maintains an opening through the hard endocarp at or near the site of attachment to the placenta. At least, before pupating the larva has eaten through the very hard endocarp and severed the placenta. Possibly by the activity of the larva, the freed stone is rotated somewhat and the larva cuts almost through the exocarp before retreating into the hollow stone to pupate. The stone seems to be fixed into place by the large amount of fecula and frass which has been removed from the interior.

From 1,161 fruit collected at "8" and "10" the writer reared 288 beetles and found 57 of the fruit to have been infested by unsuccessful larvae. All fruit was gathered from the ground on the following dates: December 1, 1946, January 16, February 23, and March 30, 1947. Emergence took place during December, 1946, and between March 11 and May 15, 1947. The fruit was held in Mason jars indoors. It is not felt that this method materially affected the time of emergence of the beetles since indoor temperatures in this case did not seem significantly different from

outdoor temperatures. This belief is supported by the fact that five beetles emerged from fruit within two weeks after being gathered on March 30. Also on December 1, 1946, numerous windfallen fruit were observed to bear fresh emergence holes.

The above stated emergence dates are out of phase with the seasonal development of the soapberries. Since the flowers do not open until late May at this locality, it would seem that beetles emerging early in the spring oviposit on developing flower buds or would have to live at least a month before being able to oviposit on developing fruit. It was believed that oviposition might take place on last year's fruit much of which still hangs in some of the trees during April and May: but on August 25, 400 such fruit were collected and examined with nothing but the previous year's damage being found.

Although the writer was unable to determine the natural whereabouts of the parent beetles, small larvae were found infesting fallen, mostly premature fruit on August 25.

In the course of studying the Leptostylus three species of parasites were reared which seemed to be primary in nature. One of these, a Chalcidoid, represented by a single specimen has been lost, but the other two have been determined, one by Mr. C. F. W. Muesebeck as *Heterospilus* n. sp. (Braconidae) and the second Mr. A. B. Gahan has indentified as *Eurytoma* sp. (Chalcidae). The five specimens of the former species emerged from a single mature Leptostylus larva. The four specimens of *Eurytoma* emerged singly from mature larvae and in one case from a teneral beetle which had not yet emerged. Also reared from the soapberry fruit are a number of moths which Mr. Carl Heinrich has determined as *Myelois venipars* Dyar (Phycitidae). Their larvae mine the fleshy exocarp of the soapberries. A series of Encyrtid parasites reared from one of these larvae are considered as being of a new genus and new species by Mr. Gahan.

64. ASTYLIDIUS LEIOPINUS Csy.

Three specimens comparing well with the type of this species were taken at the lights in Pharr May 4, June 13 and August 4-15, 1947.

65. LEIOPUS WILTI Horn

Two specimens from mesquite branches at "20," May 3 and May 24, 1947. Another on dead mesquite at "4" on June 15, 1947.

66. LEIOPUS TEXANUS Csy.

Three on dead tepehuaje branch at "5" on April 21, 1946. One beaten from mesquite at "9" on April 14, 1947. Two on huisache branch, pruned by *Oncideres pustulatus*, at "3" on April 13, 1946. One on foliage of *Mimosa Lindheimeri* Gray at "2" on July 3, 1946. And one at light in Pharr September 6-18, 1947.

67. LEIOPUS HOUSTONI Csy.

Six specimens at light in Pharr, April, August, and September. Three on branches of decadent or dead huisache at "3," "6," and "13" during April and May. Two beaten from brasil at "4" on June 8, 1947. One on fresh cut hackberry at "10" on June 30, 1946. One on fresh cut granjeno (*Celtis pallida* Torr.) six miles southwest of Pharr on July 12, 1946.

68. LEPTURGES sp. probably *confluens* Hald.

Seven from on or under bark of dead hackberry at "10" on May 5 and July 6 and 14, 1946. One beaten from huisache and one on tepehuaje at "2" on June 29 and May 4, 1946. Nine at light in Pharr, May 1 through June 15 and September 1-25, 1947.

69. LEPTURGES sp. near *confluens* Hald.

Pupae and teneral adults beaten from fallen dead yucca at "22" on August 10, 1947; and adults beaten from yucca at "12" on September 27, 1947. One at light in Pharr on August 25, 1947, and another on September 6-18, 1947.

70. DECTES LATITARSUS Csy.

One on sunflower at "6" on April 21, 1946, and one on goldenrod at "2" on August 31, 1946.

71. ECYRUS DASYCERUS TEXANUS Schffr.

Eight specimens; four from dead and dying mesquite at "7," "8," and "9," one from decadent huisache at "7" and three from lights at Pharr; March and June through August.

72. PYGMAEOPSIS VITICOLA Schffr.

One swept from weeds along canal bank at Pharr by Mr. J. U. McGuire on September 1, 1947. Another at light in Pharr on July 17, 1946.

73. CALLIPOGONUS CORNUTUS (Linsley)

A single specimen taken in flight near decadent willow branches, April 15, 1947.

74. DESMIPHORA HIRTICOLLIS (Oliv.)

Ten specimens of this beautiful species were found feeding on terminal shoots of Mexican olive (*Cordia boisseri* D. C.) at "4" on June 15 and again on September 6 and 13, 1947. A single specimen at light in Pharr on October 24, 1946.

75. LOCHMAEOCLES CORNUTICEPS CORNUTICEPS (Schffr.)

A single deformed female emerged during late August, 1946, from the same onciderine pruned branch of tepehuaje as described below under 76. Also, four specimens from the lights at Pharr, one on May 1, 1947, two on September 16, 1946, and one on August 15, 1947.

76. ONCIDERES PUSTULATUS Lec.

This is the saw beetle, familiar to all people of South Texas. This insect or its work was found at all localities in Hidalgo and Cameron Counties, being always associated with huisache, tepehuaje, and *Mimosa Lindheimeri* Gray. The adult beetles begin to appear in mid-August and remain through November. For oviposition they girdle branches ranging in size from one to two and one-half inches in diameter with the larger branches being confined apparently to tepehuaje which is composed of softer wood. In this area the beetle undergoes a two year life cycle. Rearings have been made from a tepehuaje branch collected at "2" which measured 2½ inches in diameter, representing a remarkable feat of girdling. Also rearings were made from huisache branches collected at "6" and from branches of *Mimosa Lindheimeri* Gray measuring only ½ to ⅝ inches in diameter and collected in a floodway near "4." This Mimosa, which is a small bushy shrub, was also observed to be infested by these beetles at "2." In all cases of the rearings, the branches had been girdled about 16 months before they were collected or spotted early in April, 1946. It is interesting to note that the beetles which emerged from the small Mimosa branches are fully as large as those which developed from the large tepehuaje branch.

77. ONCIDERES CINGULATUS (Say)

Frequently found pruning small branches of huisache and mesquite at "1," "4," "6," "13," "18" and "20" during September and October. Occasionally collected during May, June and July. Also, pruned branches, apparently the work of this species, found on ebony and guajillo.

78. ATAXIA HUBBARDI Fisher

Rather common at the lights in Pharr. May through June and again August through October. A single specimen at light at "11" on September 20, 1947.

79. ATAXIA CRYPTA Say

Three specimens at light in Pharr, one on May 4, 1946, and two on August 23-31, 1946. Another on coyotillo at "22" on June 24, 1947.

80. HIPPOPSIS LEMNISCATA (Fab.)

Two at light in Pharr, May 2 and September 6, 1947.

81. DORCASTA CINEREA (Horn)

One specimen on dead yellow top at "9" on October 20, 1946. Also at light in Pharr during September and October.

82. MECAS CINERACEA Csy.

On March 23, 1946, five specimens were swept from a pure stand of *Helenium microcephalum* D. C. growing in a dry resaca at "10."

83. TETRAOPES FEMORATUS Lec.

Five specimens taken in Pharr on a small species of milkweed which was widespread in alleys and vacant lots of the town, October 8, 1946.

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STUDIES IN THE CANTHARIDAE IV

(Coleoptera)

BY KENNETH M. FENDER
McMinnville, Oregon

PODABRUS COMES Lec. versus PODABRUS PRUINOSUS Lec.

The validity of *Podabrus pruinosus* Lec. and its variety *diversipes* Fall is questionable. The only characters that differentiate this from *Podabrus comes* Lec. are the color of the legs and of the head behind the eyes. The male genitalia would indicate that these are the same species. A long series from diverse areas shows all of the intermediate stages between the two. The difficulty, at least in the Willamette Valley of Oregon, lies in diverse emergence of the species. *Podabrus comes* is the first to emerge in this region. *P. pruinosus* and the variety *diversipes* commence to emerge soon after *P. comes* has started to wane. This condition is not infallable but occurs more frequently than not. Upon several occasions the author has run into pure colonies of each species. For these latter two rather weak reasons, it is considered inadvisable at this time to change the present accepted status of these two species.

PODABRUS BRUNNEUS Fender

This species was described from the Huachuca Mountains of Arizona and was known only by the holotype and allotype. Dr. H. A. Scullen of Oregon State College collected a female of this species in the Santa Catalina Mountains of Arizona on July 22, 1942, extending the known range to those mountains.

Podabrus vandykei Fender, new species

Head yellow in front of eyes, piceous behind; antennae piceous, the first two and the basal half of the third segments pale; palpi flavous, the apices of the last segment piceous. Pronotum flavous. Scutellum and elytra piceous to pale yellowish. Body beneath piceous, the mouth parts, head medially and thorax pale, sides and apices of ventral abdominal segments narrowly pale. Pubescence cinerous. Length 8.5 to 10 mm.

Male. Head wider than pronotum, finely sparsely punctate in front of eyes save for an occasional coarse puncture near the apex of the clypeus; coarsely punctured behind, these punctures sparse near the eyes, becoming quite closely punctate at the constriction of the neck. Antennae rather stout, extending only to the middle of the elytra, second and third segments equal, these slightly shorter than the other segments. Pronotum shining, subquadrate, the anterior angles oblique, the sides parallel from the anterior angles to about the basal half then converging slightly to the hind angles which are prominent; the pronotal base concave; surface finely sparsely punctate, becoming more coarsely closely so anterior to the elevations; median excavation rather deep, the elevations evenly rounded; there is no median impressed line. Elytra sparsely punctured basally, becoming finely rugose apically. Pubescense sub-erect and thick. Body beneath finely closely punctate; seventh ventral with a median impressed line. Claws of the front and middle legs finely cleft, of the hind legs toothed.

Female. Similar to the male. Antennae shorter, reaching to about the basal third of the elytra. Pronotum slightly transverse. All claws toothed.

Holotype: male, FOREST HOME, SAN BERNARDINO CO., CALIF., VI-14-28 collected by E. C. VanDyke; placed in the California Academy of Sciences. *Allotype:* female, Lytle Creek, San Bernardino Co., Calif., VI-8-28, collected by E. C. VanDyke, in the California Academy of Sciences. *Paratypes:* (2) same data as holotype but one collected VI-13-28: (1) Bull Frog Lake, Fresno Co., Calif., 10600 feet, VII-10-10, collected by E. C. VanDyke; (3) Bubbs Creek Canyon, Kings River, Fresno Co., Calif., VII-8-10, collected by E. C. VanDyke; (2) Shaver Lake, Calif., III-21-37.

The San Bernardino County specimens have the elytra piceous while those from Shaver Lake and Fresno County are yellow. There seems to be no character other than the elytral coloration for separating these. The genitalia are similar. *Podabrus vandykei* and *P. simplex* Lec. are the only members of group IV[1] that have the pronotum entirely pale. *P. simplex* is an eastern species known from Pennsylvania to Massachusetts and Canada. It is slightly over one half the size of *P. vandykei* or 5 to 5.5 mm. and the pronotum is dull and much more closely coarsely punctured; shining and finely sparsely punctate in *P. vandykei.*

[1]Pan-Pac. Ent., 25:29-32. 1949.

DISCODON NIGRIPES Gorham

A male of this species was collected in the Santa Rita Mountains of Arizona, VI-14-42, by Dr. H. A. Scullen and is a new record for America north of Mexico. Described by Gorham[2], Champion[3] records this species from "Mexico, Tepetlapa and Chilpancingo in Guerrero, Cuernavaca in Morelos, Capulalpam and Panistlahuaca in Oaxaca; Guatemala, Las Mercedes, Volcan de Atitlan."

Discodon abdominale Schaeffer, described from Arizona is the only other North American species that might be confused with *D. nigripes*. They are both flavous above, *D. nigripes* having a broad median black stripe on the pronotum. *D. abdominale* has only the antennae, palpi, apices of femora, tibiae, tarsi and last two ventral abdominal segments black, whereas *D. nigripes* has the antennae and the entire underside including the legs black. The outer claws of all tarsi are cleft, all inner claws simple in *D. abdominale*. The outer claws of the front feet are broadly lobed at base, the outer claws of middle and hind feet cleft and all inner claws simple in *D. nigripes*.

Malthodes greeni Fender, new species

Head dark brown, clypeus and mandibles yellow, antennae piceous with the basal two segments pale. Pronotum dark reddish brown, obscurely paler towards the angles. Scutellum and elytra piceous. Thorax beneath yellow. Body beneath testaceous, coxae, trochanters, apices and bases of femora and tibiae and bases of first tarsal segments pale. Sides of basal five abdominal segments widely pale, the apex of the seventh ventral pale.

Male. Head wider than the pronotum, eyes large and prominent, antennae stout, extending beyond the apices of the elytra, second and third segments sub-equal in length, intermediate segments about four times as long as wide. Pronotum transverse, margins rather widely beaded, sides nearly straight and parallel from the oblique anterior angles to the basal angles which are obtusely rounded, the anterior margin nearly straight.

Female. Differs from the male in having smaller eyes, the antennae shorter, the intermediate segments about two and a half times as long as wide. The last abdominal segment is dark blackish brown.

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[2]Biol. Centr.-Am. Coleopt., 3(2):80. 1881.

[3]Trans. Ent. Soc. London, 1915:53.

Male terminal modifications. Sixth ventral feebly narrowed apically, very deeply widely emarginate, the base of the emargination rounded; seventh ventral narrow, elongate, widely forked nearly to the base of the visible portion of the segment, apices of the seventh ventral not extending as far as the apices of the sixth; last dorsal not produced, truncate apically. Figs. 1 & 2.

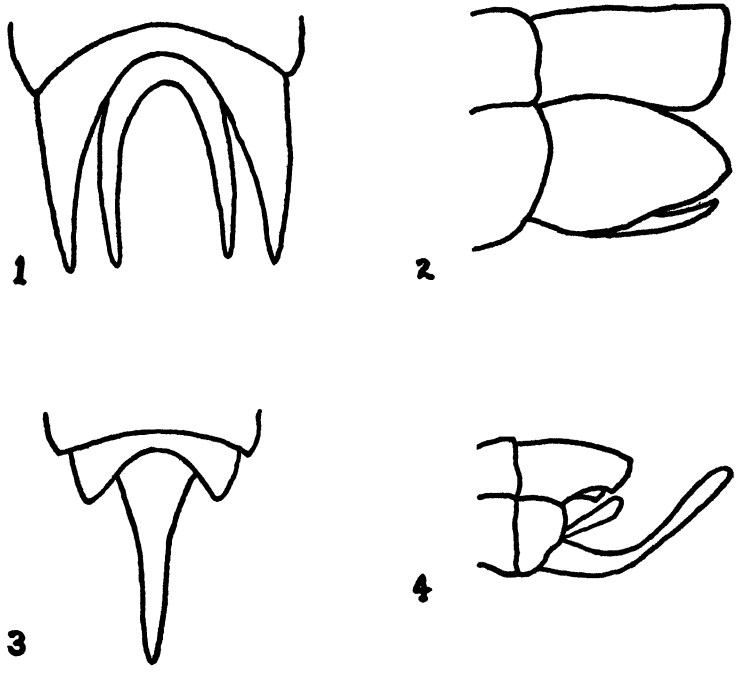

Fig. 1. Terminal abdominal segments of male of *Malthodes greeni* Fender, ventral view. Fig. 2. Same in profile. Fig. 3. Terminal abdominal segments of male of *Malthodes alexanderi* Fender, ventral view. Fig. 4. Same in profile.

Holotype: male, LUCEDALE, MISS., IV-21-30, collected by H. Dietrich, in the author's collection. *Allotype:* female, Lucedale, Miss., IV-18-30, collected by H. Dietrich, in the author's collection. *Paratypes:* (7) same data as allotype; (5) same data as holotype; (1) type locality, collected V-8-30 by H. Dietrich.

This fine species is dedicated to Mr. J. W. Green, one of our most ardent coleopterists. The male terminal modifications are entirely different from those of any other known North American species. It may be readily separated from any of our described species by its very deeply forked seventh ventral, a characteristic that is approached by no other species.

Malthodes alexanderi Fender, new species

Dark piceous, antennae black; mandibles, margins of pronotum, bases of trochanters, apices of coxae, last ventral and apex of last dorsal pale. Pubescence cinereous. Length 3 mm.

Male. Eyes prominent; head wider than thorax, rather finely granulate punctate; antennae as long as the body, segments two to four distinctly increasing in length, the intermediate segments five times as long as wide. Pronotum transverse, anterior angles rounded, the sides slightly concave, converging to the hind angles which are abruptly rounded, marginal bead slightly thicker at the anterior angles, surface finely sparsely punctate. Elytra reaching to the apex of the fifth abdominal segment, finely sparsely punctured basally, becoming slightly rugose apically.

Female. Unknown.

Male terminal modifications. Last dorsal somewhat produced, the apex truncate; sixth ventral deeply broadly emarginate, the base of the emargination evenly rounded; seventh ventral elongate, wide at base, narrowing rapidly to basal two fifths then feebly narrowed to apex which is sharply rounded; seventh ventral in profile obliquely ascending from basal two fifths; just above seventh ventral an obliquely ascending, straight, spatula shaped process which in profile appears triangularly clavate; a shorter spatulate shaped process with the sides rather strongly downcurved just below last dorsal. Figs. 3 & 4.

Holotype: male, WONDERLD TRAIL, MT. RAINIER, WASH., 5800 feet, VIII-1-47, collected by C. P. Alexander, in the author's collection.

Malthodes alexanderi runs to *M. magister* Fall in Fall's key to California *Malthodes*[4]. From that species it may readily be separated by its more elongate seventh ventral and the presence of the additional processes. It give me great pleasure to dedicate this species to its collector who has added many fine specimens to my collection.

[4]Ann. Ent. Soc. Am., Vol. XII, No. 1, pp. 31-42, 1919.

OVIPOSITION AND HATCHING OF PSELLIOPUS SPINICOLLIS CHAMPION

(Heteroptera: Reduviidae)

BY J. W. TILDEN
San Jose State College, California

A single female of this species was taken on Page Mill Road, Santa Clara County, California, about three miles from Stanford University. This specimen was retained alive for forty-nine days and considerable information concerning it was obtained.

It was found to feed readily on aphids. In feeding, the reduviid moved slowly and deliberately, apparently locating the prey by sight. Intended prey was first touched lightly with the raptorial forelegs, and then seized, and brought into position for the rostrum to be inserted. The rostrum was inserted but a short distance into the tissues of the abdomen of the aphid, and the body juices were then removed rapidly, the body of the prey shrinking in the process. In no case was the aphid seen to struggle, nor was it lifted above the surface of the stem. Of what the usual food of *Pselliopus* may consist is not known, but in the laboratory only aphids were accepted although many other sorts of insects were offered.

No eggs were laid until after feeding. Eggs were laid in small groups, several in one day, with a delay of several days between ovipositions. The first eggs hatched before the second group was laid, but thereafter, the periods between oviposition were shorter. The female was captured on June 12, 1947. Five eggs were laid on June 17, five on July 6, four on July 10, five on July 21, five on July 24, and two on July 31, on the same day that the female died. Thus thirty eggs were laid during the forty-nine day period that the female was kept in the laboratory.

All of these eggs save two were placed on the under surface of the cloth closure of the container in which the insect was kept. These two were placed on the under surface of leaves. It would seem that this species normally oviposits on the lower surface of leaves, but since the female was attracted to light, it spent a great deal of time at the top of the vial, which may account for the tendency to oviposit there. This positive phototropism was

apparent when the container was placed against a dark wall, for under such circumstances the insect invariably sought the most highly lighted side of the container.

The eggs are flask-shaped, dark brown, smooth and glossy, with the circlet of chorionic processes ("seminal cups" of Leuckart) white. The operculum is elevated and digitiform, of a beige color in freshly laid eggs. The eggs measure 1.5 mm. in length, and the diameter of the thickest part of the base is 0.5 mm. The eggs are not laid one in contact with the other, but are well separated, although several are deposited near each other, at a distance of several millimeters. The exochorion seems to be slight, although it serves to attach the egg to a surface. The chorion is tough and resistant.

At hatching, the cap or operculum opens like a lid but remains attached at one point. The nymph has cephalic spines which may serve as an egg-breaker, but it is difficult to establish this point by observation. It was concluded that they do play a part in eclosion. All appendages are tightly appressed at first. Slow movements in the vertical plane free long setae which catch on the edges of the opercular opening and prevent any loss of forward movement. When the nymph is nearly out of the egg, the appendages are worked free, manipulated until they are firm, and then the nymph drops to the surface below. None climbed upward. All dropped to the bottom of the container. The newly hatched nymphs are yellow with red eyes. This darkens to amber with dark eyes, and the appendages are ringed with black. There are eight lateral spines, very long and conspicuous, the posterior two pair larger. There are numerous other setae over the whole body.

After eclosion, the embryonic membranes protrude from the egg, giving an immediate clue as to whether or not an egg has hatched.

The young were fed on aphids, and their behavior was curious. First instar nymphs of *Pselliopus* were scarcely so big as some of the aphids, and were wary about approaching the prey. If the aphid moved, the reduviid nymphs were startled and retreated, at times losing balance and falling from the branch. They would then crawl painstakingly up again, and continue to search carefully until another aphid was found. In several instances, young

nymphs were observed to insert the rostrum before the prey was seized with the raptorial legs. Occasionally, the nymph failed to subdue the aphid on the first attempt, and either tried again or retreated to another part of the plant.

It was hoped to rear adults from these nymphs, but a necessary absence from the laboratory caused them to die from lack of food while they were in the third instar. However, it was found that the hatching time of the eggs was in most cases thirteen days, and that the eggs which were laid on June 17 hatched on June 30. The resulting nymphs underwent ecdysis on July 14, and again on July 31. The first instar was thus fourteen days in length and of seventeen days duration for the second instar. It is of interest to note that all of the eggs seemed fertile although the female was solitary during her captivity. Fertilization prior to capture sufficed. Thus it seems evident that repeated copulation is not necessary in this species. All eggs hatched except those that were preserved for study.

The specific determination is through the kindness of Dr. R. I. Sailer.

OBITUARY NOTICE

William Brodbeck Herms

William Brodbeck Herms, Professor Emeritus of Parasitology, University of California, died suddenly on May 9, 1949, at the age of 72 years and 7 months. He was born in Portsmouth, Ohio, on September 22, 1876. In 1902 he received his B.Sc. from Baldwin Wallace College, followed in 1935 by an Honorary D.Sc.

Among his many activities he will be best remembered as a leader in the field of Medical Entomology through his teaching, texts and research. It is a tribute to his boundless enthusiasm for his work that shortly before his death he had placed in the hands of the publishers an entirely revised manuscript of his valuable book, "Medical Entomology."

His passing is deeply regretted, not only by those associates and friends who knew him personally but by scientists familiar with his work throughout the world.—D. P. FURMAN.

*New names in bold face, synonyms and homonyms in italics.